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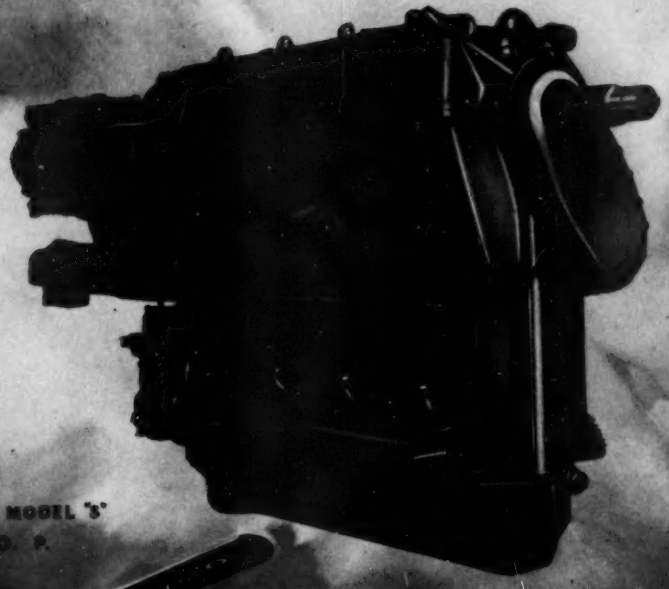

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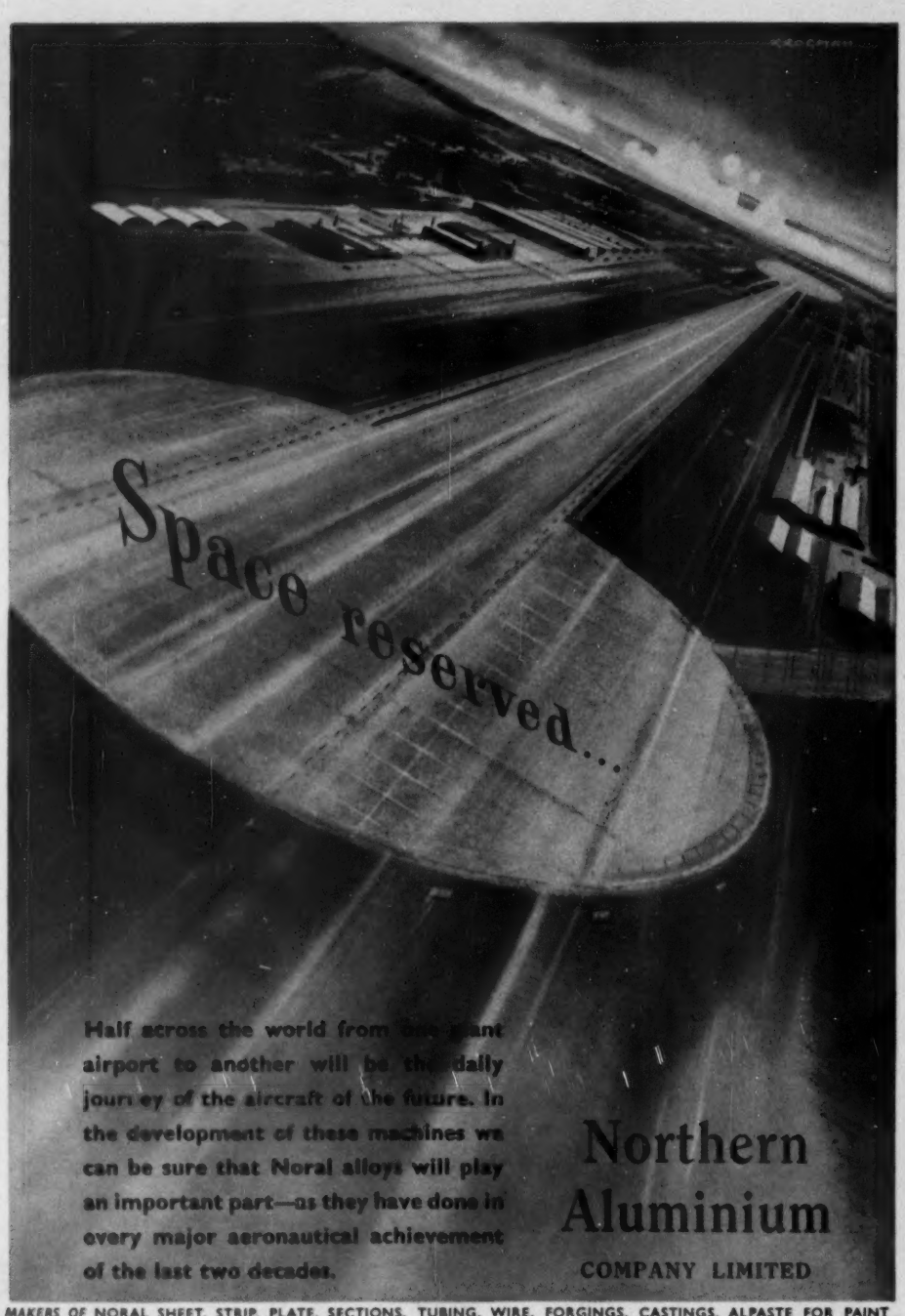
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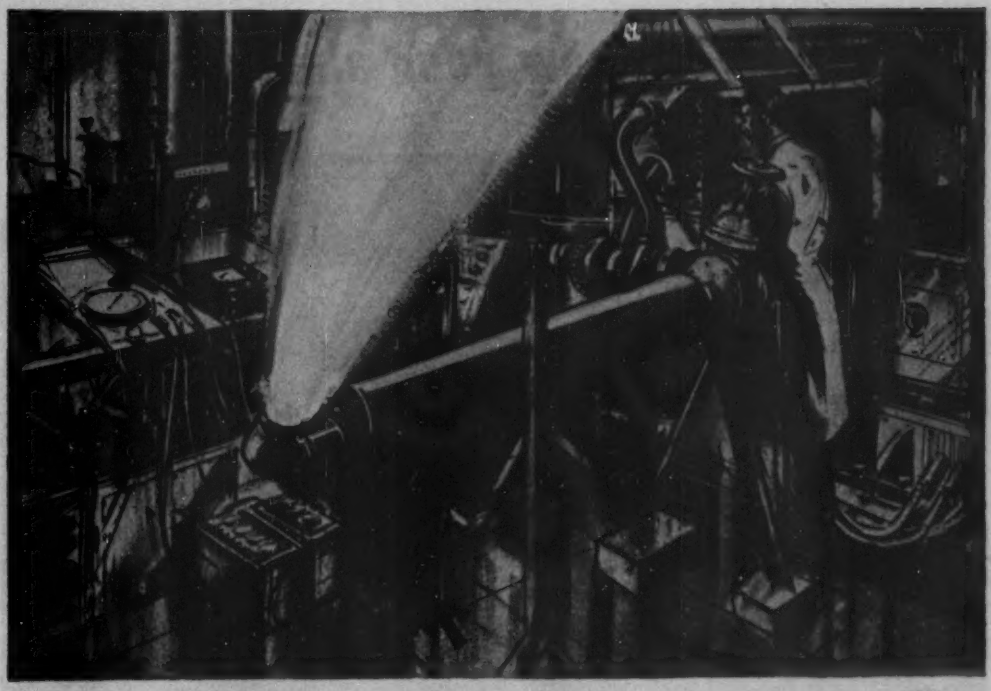

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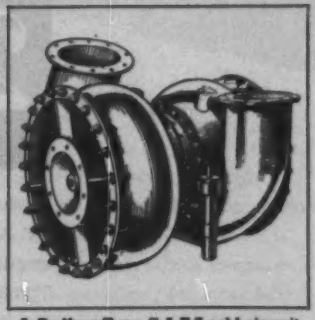

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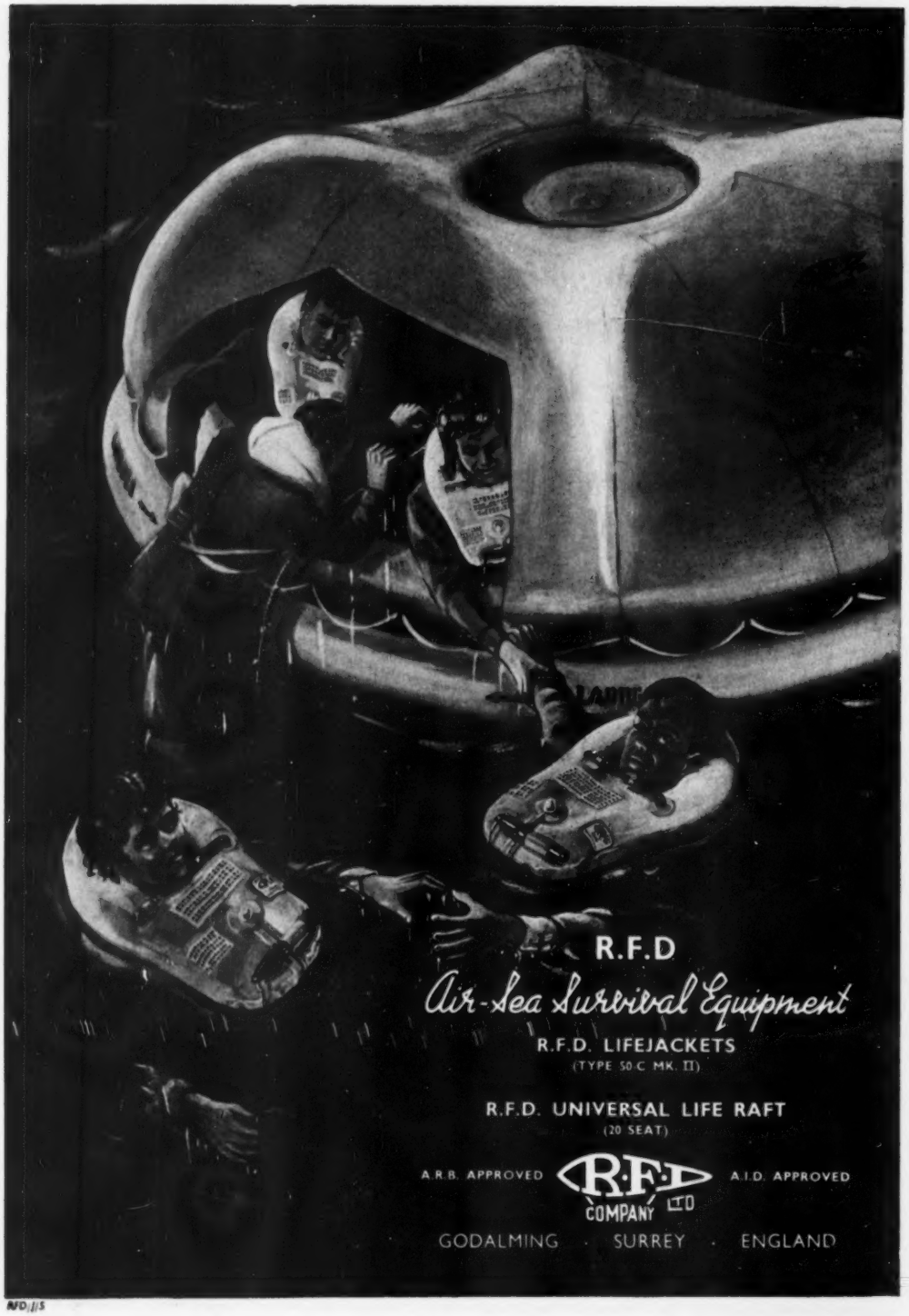
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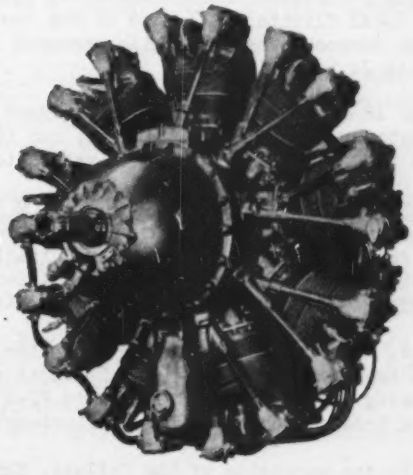

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UNITED AIRGRAM

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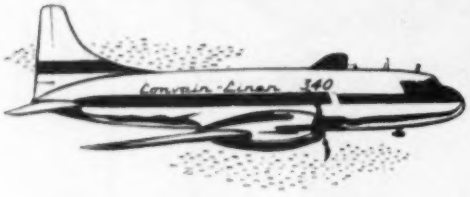
K.L.M. JOINS OTHERS IN PURCHASING CONVAIR 340s -- An announcement from Amsterdam in mid-January revealed that the Royal Netherlands Airline, K.L.M., has ordered six Convair 340 passenger planes from the United States to use in the West Indian service. The new aircraft will be added to K.L.M.'s fleet which already includes 12 Convair 240s.



This latest order brings the total of Convair 340s ordered for overseas lines to 29. Other airlines which have ordered the new airliners include: Aero O/Y, 3 aircraft; Philippine Airlines, 4; Compania Mexicana de Aviacion, 5; Aeronaves de Mexico,3; and Garuda Indonesian Airways, 8; all are equipped with Pratt & Whitney Double Wasp Engines and Hamilton Standard propellers.

SIX B-36 BOMBERS IN NON-STOP TEXAS TO MOROCCO FLIGHT -- Pratt & Whitney Wasp Major engines, assisted by turbojet engines, powered the six Convair B-36 bombers of the U.S. Air Force's Strategic Air Command which recently flew non-stop from Carswell Air Force Base, Fort Worth, Texas, to the new Sidi Slimane Air Base in French Morocco. The return trip, which took place a week later, was also flown non-stop.

This achievement marked the first time that other than local flights had landed at the new field in French Morocco. The 4,984-mile homeward flight was made in 24 hours.

The 18 crewmen in each plane shrugged off the feat as routine. Their plane, the B-36, can fly a 10,000-pound bomb load 5,000 miles and return to base.

HAMILTON STANDARD COCKPIT REFRIGERATION UNITS IN DEMAND -- Substantial orders for cockpit refrigeration units have been received from the U. S. Air Force and the U.S. Navy by the Hamilton Standard Division of United Aircraft Corporation. The division's new product has been specified for installation in seven airplane types, including jet fighters and a turboprop transport.

U.S. Air Force aircraft for which the units are specified are the swept-wing North American F-86D and F-86H Sabrejet and Lockheed F-94C fighters. Similar units are being built for the U.S. Navy's FJ-2 Fury and the Chance Vought F7U Cutlass. Others include Convair's big R3Y turboprop flying boat and an unidentified fighter.

With the exception of the Cutlass, for which Hamilton Standard is supplying the entire air-conditioning system, the Hamilton Standard units are confined to the function of supplying cooling air to the aircraft cockpits. Already flying with the Hamilton Standard unit in operation are the F-86D and the F-94C.

CHANCE VOUGHT F7U-3 MAKES INITIAL FLIGHT -- The first flight of Chance Vought Aircraft's F7U-3 Cutlass took place late in December from Hensley Field, adjoining the Chance Vought plant in Dallas, Texas, according to an announcement made by the U.S. Navy. The aircraft was designed to outfly or out-fight any other carrier-based fighter airplane in the world.

The twin-jet F7U-3 promises to be an even more formidable, better-equipped and harder-hitting weapon for the Navy's carrier-borne arsenal than its predecessor, the F7U-1, first sweptback-wing, tailless fighter to operate from a carrier.

The advanced version of the Cutlass, is larger, but similar in external appearance to the original F7U-1. It was built to give the U.S. Fleet a fast shipboard fighter with superior high altitude performance, greater range, greater rate of climb, exceptional maneuverability and the firepower to deliver deadly blows in combat.

NEW VERSION OF CHANCE VOUGHT CORSAIR -- Only a week after the first flight of the F7U-3, the new Chance Vought AU-1 Corsair also successfully completed its initial flight. Designed as an answer to the close ground support problems encountered in Korea, this latest version of the famous Corsair is heavily armed and at the same time equipped with heavy armor plate to protect the pilot from ground fire. It has been ordered in substantial quantities by the United States Navy.

The Corsair is the only propeller-driven fighter-type aircraft still in production in the United States. Since the first F4U Corsair was flown, more than 12,000 of the craft have been produced -- from the F4U-1 through the F4U-4 and F4U-5. The F4U-5 Corsair was also modified as a photographic and night fighting airplane.

U.S. COAST GUARD NOW HAS TEN-PLACE SIKORSKY HELICOPTERS -- The United States Coast Guard recently acquired an undisclosed number of 10-place HO4S Sikorsky helicopters which it will use at a number of important points of operation, it was announced recently by Sikorsky Aircraft.

Ever since 1943, the Coast Guard has pioneered in the use of helicopters for search, rescue and other missions. With the continuing improvement in helicopter performance provided by Sikorsky, this versatile type of craft has become indispensable to the Coast Guard.

Aside from rescue work, the Coast Guard uses Sikorsky helicopters in such vital routine duties as security checks of ships and anchorages...checking harbor waters for oil pollution...inspection of navigation aids...harbor surveys and numerous other missions, all performed with greater efficiency by helicopter than by any other means.

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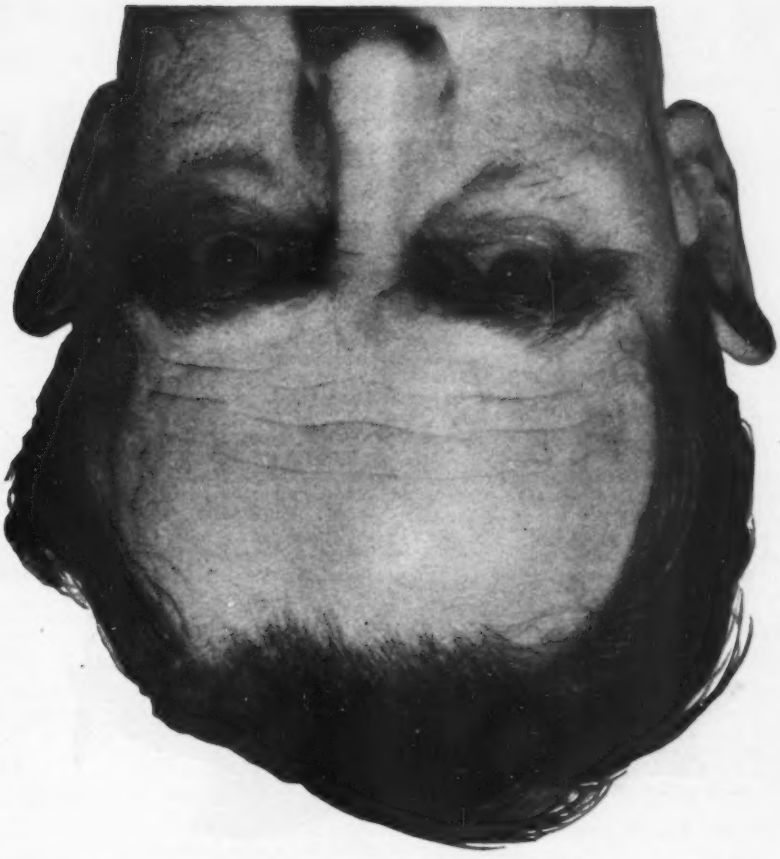

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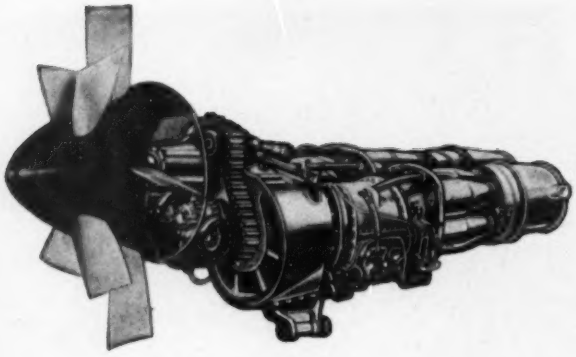

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IN THIS ISSUE:

Cu-nim Quest - - - - 312
Supersonic Problems - 318
Naval Aviation Arguments - - - - 319
Short-haul Air Transport - - - - 322
Elizabethan Shows the Flag - - - - - - 325
Breathing English Air - 326
Atomic Power for Aircraft - - - - - 330

Helicopters—Are We Keeping Up?

WITHIN the last year or two, particularly in the Korean war area but also on their numerous commercial duties, helicopters have shown themselves capable of fulfilling the most sanguine predictions of their supporters. This demonstration has been most welcome, but now it gives rise to concern lest this country's rather late start and comparatively slow progress in helicopter production may lead to a serious supply shortage; we also doubt whether adequate facilities exist for training pilots for rotary-wing aircraft.

But first, because helicopters should not be regarded as any different from other aircraft types so far as production is concerned, we may record an important pronouncement by the S.B.A.C.—made in the light of the industry's newly acquired "super priority" (the eagerly awaited measures by which this preference is to be made effective were expected to be revealed during the debates on the Air Estimates in Parliament earlier this week). Constructors, say the S.B.A.C., are aiming for a big step-up in military and civil exports, particularly of gas-turbine aircraft, while "freighters, feederline aircraft, helicopters and light aeroplanes are in the line . . . Aircraft for export serve security and solvency alike." This means that in the industry's view the building of military and civil aircraft is to be regarded as one inseparable effort, a view with which we entirely agree.

Reverting now to helicopters, we may refer to a recent question in the House of Commons. Mr. Beswick asked whether, as it was becoming increasingly obvious that both for military and civil purposes helicopters tended to be the machines of the future, the Minister would see whether he could arrange for more research into these matters, and for development to be speeded up. We are glad to note that the answer from Mr. Maclay was that the Government was "anxious to see helicopters developed as quickly as possible." The intention, at any rate, seems to be there.

In the civil field, a lead has been given to the industry by B.E.A., who did well to state clearly their future helicopter requirements.

America's Lead

An important section of the military picture today is filled in by the pronouncements of Major-General Heileman of the U.S. Army Transportation Department, who, as reported last week, believes that the "impact of the helicopter on military transportation of the future is all but impossible to over-estimate." This, he says, is not considered to be the introduction of a modified aeroplane into the air transportation system, but rather an improvement of the traditional ground transportation media to overcome most of our historical difficulties—"The helicopter is a directly applicable Army vehicle."

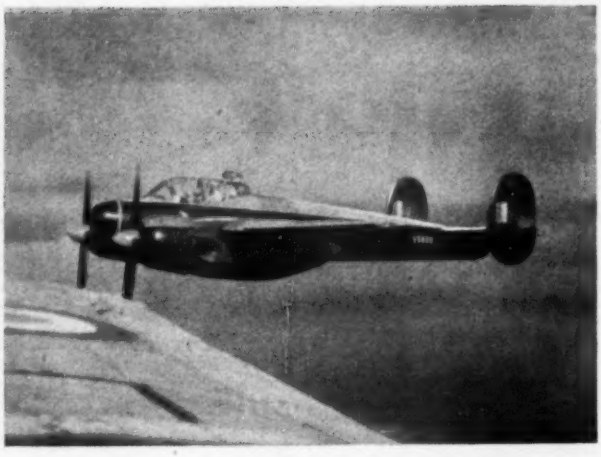
Undoubtedly America has done a great deal more in the development and application of military helicopters than this country, and we cannot help feeling doubts as to whether our own Services have fully appreciated the scale of helicopter operations which may be required in the near future. Not only are the helicopters now serving with the Army, Navy and Air Force limited in numbers and capacity, but the facilities for training pilots are, in our opinion, inadequate to meet any sudden increase in demand.

Unlike the fixed-wing squadrons, helicopter units have no civil training schools to call upon in an emergency, and, in fact, no facilities at all exist for the ordinary individual to learn to fly a helicopter in this country. Thus there is no reserve of training capacity. To fly a helicopter well and to exploit safely its remarkable capabilities requires a great many hours of experience.

There is no doubt that the helicopter will be required to fill many civil and military rôles—rescue and ambulance, communications, anti-submarine work, troop and passenger movement and mail carriage, to mention a few. How soon can we hope to have a sufficiency of aircraft and experienced pilots to fly them at current production rates? It is to be hoped that Mr. Beswick's question will not just be recorded and forgotten, but will lead to an examination of the position to ensure that helicopters do not become another of the "too lates and too fews."

CU-NIM QUEST

The Work of No. 1301 Met. Flight, F.E.A.F.



THE meteorology of the intertropical front (subject of an article in "Flight," February 15th) gradually becomes better understood. To obtain fundamental data for research and to assist local forecasters, a specialist unit of the Royal Air Force—No. 1301 Met. Flight—flies regular meteorological sorties from Ceylon. The accompanying article is based upon material (supplied by the Air Ministry) in which the former C.O. of the unit, F/L. D. G. Walker, described the work that has been accomplished during the past three years.

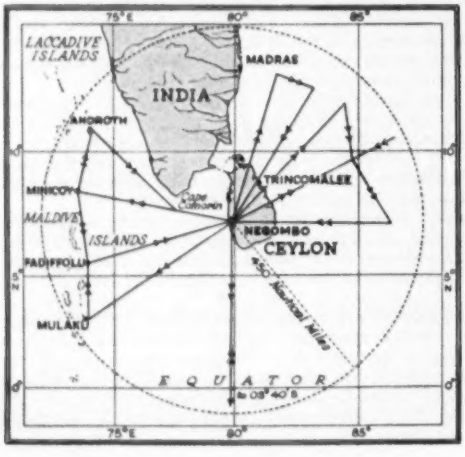
SINCE June, 1949, a less-well-known unit of the Royal Air Force, No. 1301 Meteorological Flight, based at Negombo, Ceylon, has examined weather conditions over the sea surrounding Ceylon and Southern India.

In Ceylon, information available to the forecaster is largely confined to the two main sea and air routes serving the island. The work of 1301 Flight therefore provides both statistical data for research and material for forecasting.

The Cingalese weather cycle may be broadly divided into the N.E. and S.W. monsoons and the transitional periods between them. As the sun moves north in spring, the intertropical front follows in its wake; this belt of low-pressure air may be considered as the line of demarcation between the air masses of the northern and southern hemispheres. Usually it is an area of light winds—the Doldrums—but violent weather-changes are not uncommon.

The I.T.F. has passed to the north of Ceylon by the end of May, when the south-west monsoon begins; this wind, having made a long oversea passage, is very moist and brings precipitation and cu-nim development to the island. Towards September, when the monsoon ends, long spells of fine weather lead into the winter transitory period, the I.T.F. returning to the South. At the end of the year, the drier north-west monsoon begins, and blows until spring.

The 600 flights so far made by 1301 Flight have covered most of the sea area within 450 miles of the island, but most have followed standard triangular tracks in the direction of the prevailing monsoon or, during transitional periods, through the I.T.F.



This sketch-map shows the manner in which the chief meteorological-sortie routes follow the direction of the monsoons; the sortie described in the accompanying article was made to the south-west, with turning-points at Mulaku and Fadiffolu. The heading photograph, above, shows a Brigand Met. 3 of No. 1301 Flight.

For a typical sortie the Brigand crew—pilot, nav/met. observer and signaller—report at 0530 hr to the duty met. officer, who will have decided the route from the previous day's information; in this case, a triangle with turning points at Mulaku and Fadiffolu.

Taking off at 0630, course for Mulaku is set at 950 mb or about 1,700ft. Every 50 n.m. the navigator takes a series of met. observations, and a sea-level observation is made half-way along the first leg. A pinpoint and second sea-level observation are made at Mulaku, after some 2¼ hours' flying; a "box" climb is then started to 400 mb, the Brigand being levelled off for observations every 50 mb. The climb—to a true 25,000ft—is completed in some 25 min and course then is set for Fadiffolu, whence course is set for base. After a flight of 200 n.m. to a D.R. position, a box descent is begun down to sea level; the final return to base, reached six hours from take-off, is made at 950 mb.

Navigators found it difficult, at first, to combine their basic trade with that of met. observer, since observations are required every 12 to 15 minutes. Navigational accuracy has been very high, reliance being placed on pure D.R., radio bearings and, at low level, estimated or three-drift winds. The standard T/R 1154-55 has given excellent service; the signaller, in addition to his normal position-reporting and obtaining loop and H.F. bearings, has also to transmit three meterological messages, each of some 60 or 70 groups.

The crew now come to the more spectacular aspect of the job, namely, cu-nim penetration. From the outset, no deviations have been made owing to weather. The best penetration speed of the Brigand luckily corresponds with the met. cruising speed—175 kt—thus cutting preparation to a minimum. The Mk.8 autopilot is disengaged, pitot heat switched on and the crew warned and straps checked. Engine settings are untouched, except to use warm air between 8,000ft and 15,000ft; at low levels, cruising r.p.m. as low as 1,600 provide sufficient suction for the flight instruments. The standard thunderstorm technique has been adopted, attitude being maintained by reference to the artificial horizon and the minimum of correction normally being applied; the other instruments, apart from the direction indicator, are practically ignored.

Low-Level Penetration.—The cloud-base may be as low as 300ft, although 800ft is more usual. Up to 2,000ft the

predominant feature is the precipitation. This may be so heavy as to make it impossible to see the cowlings from the cockpit; it may reduce the wire-mesh de-icers to ribbons and severely damage the unsheathed roots of the wooden airscrews. The generally slight turbulence is of a sharp, bumpy nature, although a height increase of some 500ft is to be expected in a normal traverse. An I.A.S. increase of 15 to 20 knots is general; lightning has been frequently reported but no strike recorded at this height.

Medium-Level Penetration.—Between 8,000ft and 15,000ft experience is more limited, although climbs and descents through turbulent cloud have been made over this range. It has been found largely necessary to abandon manœuvres on entering the more active parts of the cloud and to maintain a straight and level attitude at the best estimated engine-settings; this, however, adversely affects the accuracy of the psychometer (a wet and dry-bulb thermometer for measuring relative humidity), which demands a constant airspeed.

High-Level Penetration.—The upward limit of cloud development is still a matter of conjecture. During the south-west monsoon, particularly over the Maldive Islands, cumulus is common up to 25,000ft. An anvil is usually found between 23,000ft and 27,000ft, while cu-nim development may extend to 35,000ft. The clouds which form over Southern India during the winter transitional period, and which have been met over the sea area off Madras, are believed to reach to over 40,000ft; they have provided the worst flying conditions so far experienced.

Much of the flying at 25,000ft has been made in cirro-stratus—usually dissipated cu-nim anvils—and warning of approach to an active cu-nim may be obtained by radar, by a sudden increase in V.H.F. static, or, visually, by a sudden increase in cloud-density. Dry-ice particles are the normal constituent, although super-cooled water has been found. Airframe icing has been negligible and de-icers torn off by heavy rain at low levels have not been replaced; on the other hand, air speed has frequently gone "off the clock" despite pitot heat. Turbulence has varied from slight to severe, with altitude changes of 2,000ft and lateral displacements of up to 45 deg in the worst cases. Lightning and static, although frequent and spectacular, have caused little damage.

While a great amount of information has been accumulated by the Flight, the problem of the forecaster is as formidable as ever. The daily lapse-rates, as plotted on the tephigrams, reveal no pronounced variation and, subject to space-time variation, changes are usually insufficient for use as a forecasting basis. The problem is more one of local development than of movement; weather reported out to sea generally loses its character before reaching Ceylon.

Flying conditions are usually nearly perfect in the area, but large build-ups are always possible, especially during the south-west monsoon and transitional period. The I.T.F. may be violent one day, and yet not be evident at all the next. No definite life-span can be quoted for cumulo-nimbus, although violent activity is usually brief. The complete cycle, from small cumulus to complete dissipation, has occurred in forty minutes; on the other hand, series of large clouds have covered an area for four days.

One has to learn to take the weather as it comes. The worst part of cu-nim flying is looking at the clouds before penetration; if the choice is open, flight below 5,000ft or above 25,000ft will usually provide easier conditions. Correct precautions must be taken before entering and, once inside, the pilot must stick to the attitude technique.

FROM ALL QUARTERS

Royal Approval

AFTER making a tour of some of the de Havilland ground establishments at Hatfield on Thursday of last week, H.R.H. the Duke of Edinburgh enjoyed a flight in Series 1 Comet G-ALYP, accompanied by Sir Geoffrey de Havilland and other directors of the company. John Cunningham and Peter Bois took the party over Reading to cross the coast at Bournemouth; the Comet then turned east to Brighton, whence the descent to Hatfield began *via* Chelmsford. London Airport control had been watching ALYP by radar throughout the flight, which lasted one hour and twelve minutes.

The Duke chose the occasional seat between, and behind, the pilots for both the take-off and landing; he found the experience "thoroughly enjoyable."

Before lunch, S/L. Derry put on a special demonstration of low-level aerobatics with the prototype D H 110 all-weather fighter.

Sitting-in: The Duke of Edinburgh in the cockpit of G-ALYP shortly before the take-off from Hatfield. His pilot (left) was John Cunningham, with Peter Bois as co-pilot. (See "Royal Approval," above.)

Aviation Affairs at Westminster

IN the House of Commons on March 10th, Mr. Frank Beswick asked if the Minister of Supply was aware that there was a feeling that the lead we had established in the jet-aircraft field was not so clear as it had been. Did he think that at present we could afford to lose the services and advice of Sir Frank Whittle?

Mr. Duncan Sandys replied that the case of Sir Frank was another matter, but on the general issue he thought that British achievement in the field of jet engines was sufficiently proved by the number of licences which had been taken out by Americans and others to produce these engines.

Mr. Beswick also asked for details of the jet transports now being developed to follow the Viscount and the Comet II, and to this Mr. Sandys replied that preliminary work was proceeding on several projects, but it was too early to make any detailed statement.

Mr. Beswick then asked the Minister if he agreed that unless we had a bigger and, if possible, faster machine by 1956-57 we should have lost our lead in this field. Would he give an assurance that, if possible, extra priority would be given not only to jet transport-aircraft production, but also to the development of their successors?

Mr. Sandys said he agreed particularly with the latter statement. It seemed to him that what we had to do was to make good the lead already established—which meant accelerating in every possible way the production of the Comet and other new aircraft which were either in, or going into, production.

On the following day the subject of manpower in the aircraft industry came under discussion, the Minister of Labour, Sir Walter Monckton, replying to several questions on the calling-up of apprentices for National Service.

A. Cdr. Harvey asked Sir Walter if he could explain how the

FROM ALL QUARTERS . . .

aircraft industry was to produce what was expected of it when the men who were most valuable had to be called up at the end of their training.

Sir Walter said that his anxiety was to meet the difficulty so far as he could without impinging on the desirability of keeping the universality of the call-up.

Asked if it was not much more important to get higher production of aircraft for defence purposes, Sir Walter said the matter was being closely examined, but that the main desire was to introduce limited deferment while at the same time discouraging similar claims from other quarters.

Next day, March 12th, the indefatigable A. Cdre. Harvey sought information from the Minister of Defence. What steps, he asked, had been taken to prevent foreigners in Britain approaching the perimeter of Service units, including radar stations?

Mr. Nigel Birch (Parliamentary Under-Secretary) said there were adequate security arrangements at these establishments to prevent the entry of unauthorized persons, and such steps as were possible were taken to ensure that secret equipment could not be seen from outside the perimeters.

Jet transports were again the subject of questions when, on the 12th, the Minister of Transport and Civil Aviation said that "provisional plans are based on bringing the Comet Series II aircraft into service towards the end of 1953, the Viscount at the end of this year and the Bristol 175 about the end of 1954."

Brabazon II and Princess: A Hold-up

AN important statement on the Brabazon II and the Princess flying-boats was made by Mr. Duncan Sandys, the Minister of Supply, in the Commons last Monday. In reply to a question by A. Cdre. Harvey, he said: "The second Brabazon and the three Princess aircraft are in various stages of construction. It was earlier intended that they should be fitted in the first instance with Bristol Proteus 2 aircrew-turbine engines. However, as the work proceeded it became evident that great economy would be achieved by waiting for the production of the more powerful Proteus 3 engines, which are not yet available. It has, therefore, been decided to postpone for the time being the work of completing the second Brabazon and the second and third Princesses.

"This will release capacity for more immediately needed military and civil aircraft construction and will result in a saving of over £2 million in the coming financial year. In the meantime the first Princess flying-boat, which is now nearing completion, will be fitted with Proteus 2 engines, so that experimental test flights can proceed.

"The decision does not mean any change of view about the value of large aircraft in general or of these types in particular. There is, of course, no intention of abandoning these two important development projects."

STAR-SPANGLED: For three reasons this official photograph is of more than usual interest: first, it shows the scene aboard H.M.S. "Perseus" during trials in American waters whereby the U.S. Navy will assess the potentialities of the new British steam catapult, described in "Flight" of January 4th; secondly, it is notable for the variety of aircraft, for, in addition to the Hawker Sea Fury in the foreground, there are Grumman Panthers, McDonnell Banshees, Douglas Skynights and a Piasecki HUP-1 anti-submarine helicopter; thirdly, it shows a superstructure over the carrier's stern—an apparent obstruction to landing-on.

Great Day in May?

THE operational staffs of B.O.A.C. are now busy preparing for the great day when they launch the first pure-jet passenger service in the world, and it now seems certain that this will take place during the first few days of May. The Corporation will need a minimum of four Comets to open the service, and so far three have been delivered; a fourth is due in mid-April and a fifth should follow very shortly after the services begin.

To Australia Faster Still

LAST Sunday, March 16th, the third Canberra (two Rolls-Royce Avons) to fly to Australia landed at Darwin on its delivery flight to Laverton, Victoria. Piloted by S/L. G. Tuck, R.A.A.F., the bomber cruised at over 40,000ft, with stops at El Adem, Karachi, Ceylon and Singapore; the 10,250 miles from Hurn to Darwin were covered in 20 hr 20 min flying time—an average of 504 m.p.h. Elapsed time was approximately four days.

The aircraft had for some weeks been at Hurn testing a variety of special equipment; this includes, *inter alia*, a new radar bomb-sight and apparatus for defence against guided missiles.

This Canberra—which, it is stated, will remain the property of the Ministry of Supply—will eventually be employed at Woomera; the two previous Canberras, delivered to the R.A.A.F., were to assist the launching of Canberra production in Australia.

"ANGELS ONE FIVE", the much-discussed Battle of Britain film, was due to have its world premiere at the Empire Theatre, Leicester Square, last Wednesday. Here are two "stills" from the picture: on the left, a flight commander (played by Andrew Osborne) walks wearily away from his Hurricane after a one-sided battle; on the right, the station commander (Jack Hawkins) chats with one of his squadron leaders, Michael Denison. We have seen the film, the Hurricane sequences of which are first-rate: of the enemy aircraft—represented by model-shots—the less said the better.

London Helicopter Trial

AT lunchtime last Monday the B.E.A. S-51 helicopter G-AJOV was seen flying past *Flight's* office near Blackfriars Bridge at a height of only a few hundred feet—it went as far as Tower Bridge and then returned. Intrigued, we made inquiries and found that Capt. Cameron was the pilot and that, at the request of the M.C.A., a preliminary examination was being made of the approaches to the Festival site—discussed as a possible helicopter station—at South Bank. Noise level on the ground was also being studied. The route flown by the S-51 from London Airport was over Hounslow Heath, Richmond Park, Barnes Common, Hurlingham and Battersea Park.

W/C. "Johnny" Baldwin Missing

AS we close for press, we learn that W/C. J. Baldwin, D.S.O. and Bar, D.F.C. and Bar, A.F.C., has been posted missing in Korea, where he was serving under the officer-exchange scheme with the U.S.A.F. The scanty information so far available indicates that he was one of a number of pilots making a weather reconnaissance and that his aircraft was last seen entering a cloud. It is not thought that he was shot down.

Long Legs and Small Fields

FOR a score of years de Havilland products have served the feeder airlines of the world and it must therefore be gratifying to the Hatfield firm to receive orders that promise to maintain this tradition: in the near future, Herons are to enter service in Europe, South America and Indonesia.

It is reported from Singapore that 14 aircraft of this type have been ordered by Garuda Indonesian Airways for operation on internal routes. This company, formed to take over the pre-war operations of K.N.I.L.M., maintains an extensive network of routes within the islands and to Singapore and Manila with a fleet comprising DC-3s, Convair-Liners and Canso amphibians. K.L.M. is managing the operations of G.I.A.

Two Herons are shortly to be delivered to Brazil for service with Transportes Aereos Salvador Limitada on routes linking Salvador with other cities in Bahia Province; and in Norway two will be used on internal services by Braathen's South American and Far East Airtransport A/S.

The ability of the Heron to operate from small airfields has, perhaps, created some domestic jealousy at Hatfield, for during a recent local "clamp" the Comet G-ALYP decided to use the undulating sward at Luton, flying back to its own hard runway when the weather improved!

LADY AT LOCKHEED: Mme Jacqueline Auriol, daughter-in-law of the President of France (she averaged 508.8 m.p.h. over a 100km closed-circuit in a Vampire last May) is seen after a recent flight with test pilot Carl Patton in a Lockheed T-33 jet trainer. After returning to France Mme. Auriol was involved in a crash, but escaped unhurt.

ITALIANS IN AFRICA: This French-registered Macchi M.320 is of the type recently ordered by the East African Airways Corporation for use on its services in Kenya, Uganda and Tanganyika. Powered by two 185 h.p. Continental engines and having accommodation for six people, the M.320 is said to be very suitable for operation from the high-level aerodromes used by E.A.A.C. Three are on order and five more may be purchased.

New R.A.F. Recruiting Scheme

PLANS have been prepared by the Air Ministry to recruit nearly 20,000 men of 17½ years of age as ground tradesmen during the next 12 months. Under this scheme volunteers will make short-service engagements of either three or four years, carrying the pay and conditions of regular airmen. These volunteers will not be called for National Service when 18 years of age.

Those engaging for three years will be liable for 2½ years' reserve service and those signing-on for four years will spend 1½ years in the reserve.

Until now, the young man of 17½ who wished to be a ground tradesman was eligible for only the normal regular R.A.F. engagements of 5, 8, 10 or 12 years. The three and four years' engagements were open only to those who had already been called for National Service.

Young men who had passed pre-selection tests for aircrew duties, however, since the early part of 1951 have been able to begin their specialised training at 17½.

H. J. Nixon Joins Alvis

IT has already been reported that the plans of Alvis, Ltd., include a two-row Leonides, so it is to be expected that production capacity at the Coventry works may shortly be expanded. It is, therefore, interesting to learn that Mr. H. J. Nixon, M.I.P.E., is shortly to join the firm as works director; he will take his seat on the board next month.

Since 1935 Mr. Harold John Nixon—whose identity should not be confused with that of Mr. W. E. Nixon (D.H. managing director) joined the de Havilland enterprise in 1934, and latterly has been production manager at the Lostock, Lancs, factory of de Havilland Propellers, Ltd. Now 52 years of age, he was educated at Guildford Grammar and Technical School and served in World War I. He began his engineering career with the Guildford firm of Dickinson and Burns, and later went to Canada, as a production engineer with the Ford Motor Company there.

Aviation History Screened

BRITAIN during the last 50 years is the theme of an excellent Associated British-Pathé film, *Hero's to the Memory*, shortly to be given its first public showing. It includes many items of aeronautical interest and a considerable portion of the commentary is given by Lord Brabazon of Tara.

Among the aviation sequences are pre-1914 views of Blériot monoplanes, the Wright Brothers, Hamel, Pégoud and Cody. An aircraft factory and a line-up of Sopwith Camels appear in the World War I sequence.

Between-the-wars scenes include shots of many well-known pilots, including Alcock and Brown, Kingsford Smith, Mollison, Lindbergh, Cobham, Amelia Earhart, Jean Batten and Amy Johnson. The Schneider Trophy races are represented by a sequence showing an S.5 taking-off and air transport is brought in with a fine close up of the Empire flying-boat *Canopus* making one of its first flights.

The 1939-45 war sequences include fighter pilots scrambling, Spitfires, Hurricanes, Bostons, a Lancaster, glider-towing and some Ju88s and Me110s. An air view of an atomic-bomb test appears in the "peace" section with which the story of the film concludes.

Two issues of *Pathe Pictorial* which are soon to be released include air subjects. One shows a 45-minute turn-round at London Airport of the T.W.A. Constellation *Star of California*; the other depicts pilots of No. 2 Ferry Pool, Maintenance Command, collecting an Auster A.O.P. and a Meteor 8.

HERE AND THERE

EGG-BEATER BEAT-UP: A Piasecki HUP-2, first of a batch for the U.S. Navy, is caught by the camera in a most un-helicopter-like attitude during a demonstration at Philadelphia Airport. In the foreground, looking on, are Cdr. William Klopp, U.S., representing the Bureau of Aeronautics, and Mr. Frank N. Piasecki, chairman of the Piasecki Helicopter Corporation.

Atomic Aircraft No. 2

IT was announced by the U.S. Defence Department last week that contracts had been placed for the construction of a second nuclear aircraft power plant and an airframe to utilize it: the firms concerned are, respectively, Boeing at Seattle and Pratt and Whitney at East Hartford, Conn. Both contracts were placed last year. The first atomic-powered aircraft will be the result of co-operation between Convair at Fort Worth with General Electric at Lockland, Ohio.

A Piper-Stinson Again

A NEW low-wing, twin-engined, four-seat aircraft to be known as the Piper Twin-Stinson has been designed by Piper Aircraft Corporation for production in 1953. Of all-metal construction, with a retractable tricycle undercarriage, it will be the first Piper-Stinson since the 1949 "Flying Station Wagon" which was marketed immediately after the Corporation purchased the Stinson Division of Consolidated Vultee.

Mystére Production

THE U.S. Mutual Security Agency announces that shipments of £1,850,000-worth of American machine-tools to France will enable production of the Dassault MD-452 Mystére to begin in April and reach a rate of thirty per month this year. The Agency recently stated that "the Mystére stole the show from a Sabre" in a recent test flight, but this report is now strongly denied by Brig-Gen. Boyd, U.S.A.F., who was flying the Mystére at the time; the presence of the Sabre was, he said, merely required for calibration of the French fighter's A.S.I. Another U.S.A.F. spokesman stated that the U.S.A.F. had, as far as he knew, no plans for buying the MD-452.

The Swiss Swift Affair

REPLYING to a question in the House of Commons concerning the publication of Supermarine Swift details in *Interavia* [commented upon in *Flight* of February 29th, page 231], Mr. Duncan Sandys, Minister of Supply, said last week that he did not think there had been any leakage of secret information. Particulars given in the articles were incorrect, he said, and had been based upon surmise.

Von Braun Aims Higher

THE "master-mind behind the V-2," Dr. Werner Von Braun, writes in *Collier's* that "the first-space-ship will be a reality in 10 to 15 years." The learned doctor, who is one of nearly 100 German scientists now working on guided missile development at the Army ordnance centre at Huntsville, Alabama, goes on to say that a first cost of £1,438,000,000 including research expenditure, "appears reasonable." A three stage rocket would be used to reach an orbit 1,075 miles out, where the final stage would become "the first plank" of a satellite. Russia was in the race, but America had the advantage if she moved quickly.

ICED—on the ground: A McDonnell F2H-2P Banshee—the U.S. Navy's new turbojet photo-reconnaissance aircraft—presents an odd picture after a sleet storm that swept the makers' airfield at St. Louis, Mo.

The Admiral Blows the Gaff

A NEW U.S. Navy guided missile for use against bombers can find and destroy its target at ranges of up to four miles from the aircraft from which it is launched. Known as the Sparrow, the weapon is to be produced in a ground-launched version also. These disclosures were made recently by an American admiral before a Senate sub-committee which he thought was sitting in secret; actually, it was hearing evidence on machine-tool shortages.

France Loses a Fine Pilot

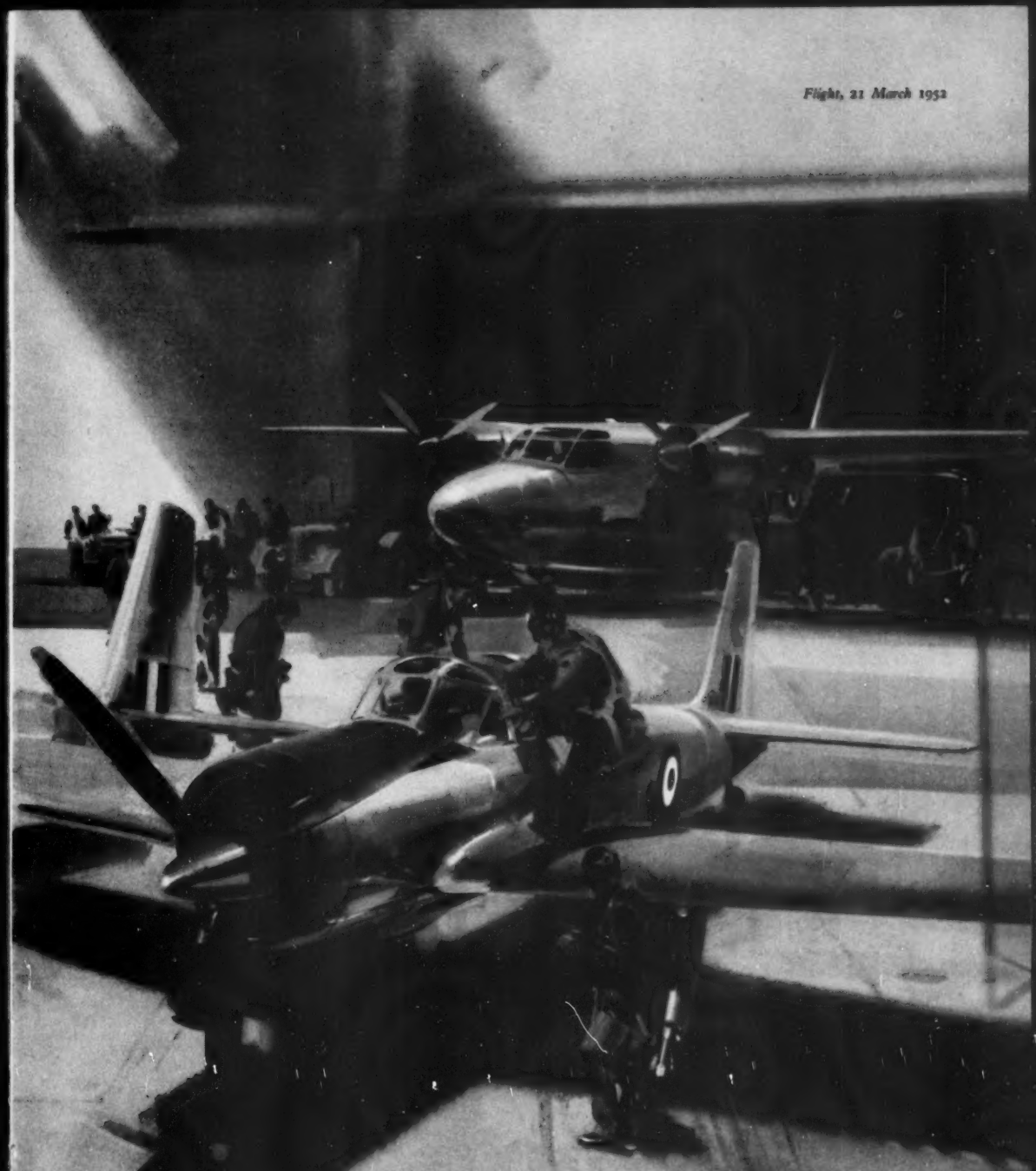
THE French fighter prototype lost on February 24th has, in fact, turned out to have been the second Arsenal VG-90, as surmised in *Flight* of the 29th of that month. It is now known that the pilot was M. Claude Dellys, a S.N.C.A.S.O. test pilot, who was at the time of his death attached to l'Arsenal de l'Aéronautique. His loss will be a great blow to French aviation; it was he who conducted the flight trials of the S.O. Ariel helicopters. He was a former member of Le Patrouille d'Étampes.

R.A.F. Fertilizer Command?

A SUGGESTION that R.A.F. aircraft should assist in fertilizing hill-farmland was made by the Earl of Listowel—and well received—in the House of Lords last week. Seconding the proposal, Lord Llewellyn, a former Minister of Food, disclosed that, when it was feared that the Luftwaffe might use gas-bombs, gas-spraying apparatus was developed for the R.A.F. and disguised by the suggestion that it would be employed on fertilizer-spraying. It was announced that three civil firms were currently engaged on aerial fertilizing in the United Kingdom.

Civil Aviation Careers

MANY young men and women contemplating a career in civil aviation are hazy about qualifications, pay and conditions, and on where to seek engagements. *Flight* receives a number of inquiries of this kind and evidently the Ministry of Civil Aviation does also, for it has now published a useful little guide under the title *A Career as Pilot in Civil Aviation*. Among the contents are the principal requirements and rates of pay, pension and insurance for Airways Corporation pilots, with similar



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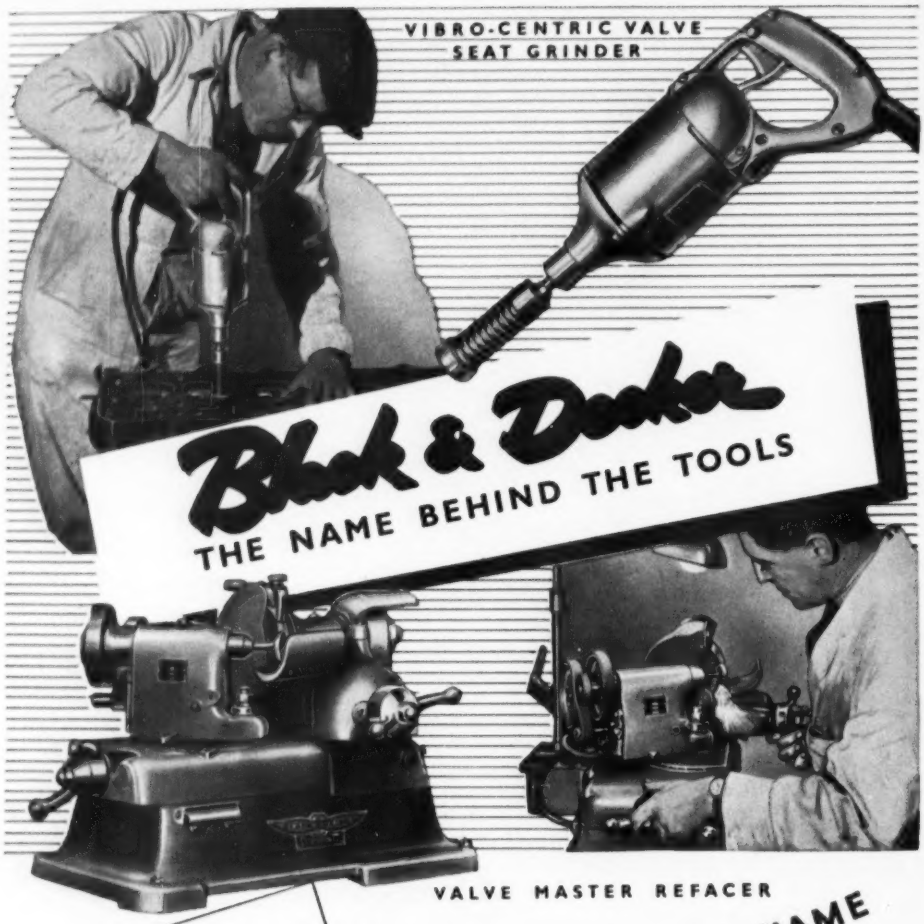

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HERE AND THERE . . .

information, so far as it is available, pertaining to pilots employed by independent operators, to flying instructors and to test pilots. Advice on civil-aviation pre-selection (for Service personnel), on licences, and on sources of further information is also included. The booklet (M.C.A.P. 99) is obtainable free of charge from the Training Branch of the Ministry of Civil Aviation, Ariel House, Theobald's Road, London, W.C.1.

Convair XF-102

ORDERED "off the board" by the U.S.A.F., the Convair XF-102 fighter will be a supersonic delta-wing single-seater with a Pratt and Whitney J-57 turbojet. According to *Aviation Week*, it will be equipped with a fully automatic electronic pilot, manufactured by Hughes Aircraft, and will carry a human pilot only as a monitor. It is understood that the principal armament will be a single guided missile.

"Personally, I don't go a bundle on this prone-piloting business."

That Overnight Atmosphere

UNTIL humidification of airliner cabins becomes general practice, and with the now-imminent higher-density "tourist" seating, pressurized cabins are likely to be not only dry, but stuffier also. In this connection, and so far as women passengers are concerned, advice given by two experienced Atlantic air hostesses, and quoted the London *Evening News*, sounds practical. These passengers, they say, can counter the effects of the dry air by: (*a*) using light make-up; (*b*) choosing a make-up foundation with an oily base; (*c*) spraying the hair with brilliantine to keep it soft; (*d*) avoiding the use of heavy perfume. From our own experience of transatlantic cabin air we can heartily endorse item (*d*).

PICK-ME-UP: This new R.F.D. one-man lifecraft, designed to an R.A.A.F. specification, includes an inflatable double-skin protective apron in addition to most of the usual equipment (drogue, stabilizers, inflation cylinder, etc.) found in larger patterns. Its compactness and light weight should make it particularly suitable for ejector-seat use, while it will also serve as a warm sleeping-bag on land.

Look, no hands!

THE new automatic pilot developed by General Electric for the U.S. Navy can, according to a G.E.C. spokesman, "do anything a human pilot can do, except take-off and land." He added, "it controls the plane at near sonic speed and can be used in such manoeuvres as gunner runs on enemy aircraft." Claimed to free the pilot of 90 per cent of his stick-and-rudder work, the autopilot contains a compass and non-toppling gyros; accuracy quoted is plus or minus half a degree in bearing and to within 25 ft of altitude up to 10,000 ft. The device will, it is stated, restore a fighter to level flight from any position "up to 75 deg."

IN BRIEF

ALMOST every conceivable aspect of the production and use of petroleum fuels and lubricants is dealt with in the series of "factual memoranda" leaflets now available free of charge from the Petroleum Information Bureau, 29, Old Bond Street, London, W.1.

* * *

From Precision Components (Barnet), Ltd., 13 Byng Road, Barnet, Herts, comes a leaflet describing their interlocking bench assembly trays for small parts. Of Bakelite, the trays are available in both straight and (to form a semi-circle) curved types.

* * *

Mr. L. Bagrit, managing director of Elliott Bros. (London), Ltd., is at present in the United States on business. His visit is concerned with, among other things, the manufacture of certain types of Elliott electronic apparatus under licence.

* * *

Amal Ltd., have moved from their Perry Barr, Birmingham, address to new premises at Holdford Road, Witton, Birmingham 6. The telephone number (Birchfields 4571) remains unchanged; the telegraphic address is "Amalcarb (phone) Birmingham."

* * *

Normalair, Ltd., announce that Mr. J. Fearn has resigned the chairmanship but retains his seat on the board. Mr. E. Mensforth, C.B.E., has been appointed chairman and Mr. D. C. Collins a director. Messrs. Fearn and Mensforth are also directors of Westland Aircraft, Ltd.

Ransome and Marles Bearing Co., Ltd., announce the appointments to their board of Mr. Ernest Belcher (as director and sales manager) and Mr. J. B. Samson, M.I.Mech.E., Mem.A.S.M.E., M.I.P.E., A.R.Ae.S. (director and works manager).

* * *

The whole range of gyroscopic apparatus, from 180-ton stabilizers once built for ships to modern aircraft instruments, are described and illustrated in an informative and entertaining 44-page booklet published by the Sperry Gyroscope Co., Ltd., Great West Road, Brentford, under the title *The Gyroscope through the Ages*.

* * *

The Glacier Metal Co., Ltd., has acquired the capital of Scottish Precision Castings, Ltd., Hillington Estate, Glasgow, manufacturers of aluminium and brass die castings. The latter firm will retain its name and identity, but its products will be sold at home and overseas by Glacier.

* * *

Mr. F. W. Burnard, M.B.E., A.R.Ae.S., A.M.I.P.E., has been appointed works manager of Field Aircraft Services, Ltd., factory at Tollerton Airport, Nottingham. From 1924 onwards he was successively with Westlands (going to India on the Houston Everest Expedition, and eventually becoming the firm's chief service engineer); Scottish Aviation (becoming works manager); and the de Havilland Propeller Co. as a member of the management production team at the Lostock, Lancs, factory.

MORE FOR A.O.P.: The Auster Mk 6 was recently put into extended production. In this photograph, of three of the new series awaiting collection, the leaf-spring tailwheel attachment—now a standard feature—can be seen.

SUPERSONIC PROBLEMS

Investigating the Shape of Things to Come . . . and Go

MANY of the problems associated with the performance of guided missiles and supersonic aircraft are now being physically investigated with the aid of the world's largest supersonic research tool—the 8ft by 6ft supersonic wind tunnel at the N.A.C.A. Lewis Flight-Propulsion Laboratory, Cleveland, Ohio. With missiles flying in excess of Mach 2.0, and tactical supersonic aircraft a certainty, it is of first importance that immediate research attention be given to the problem of eliminating or lessening the serious effects imposed upon the power output by flight manœuvres. With this is allied the necessity to elucidate the concomitant problems of power-unit/airframe relationship and power installation.

Among factors influencing the thrust of supersonic air-breathing engines, the most important from an installation viewpoint is the total pressure "felt" by the engine inlet; a 25 per cent pressure-loss, for example, between the free-stream and the combustion chamber inlet will result in a 35 per cent thrust reduction. Although pressure losses are not wholly avoidable, the inlet problem has been explored and data assembled to permit design of inlets giving good engine thrust at twice the speed of sound, at zero angle of attack. However, the problem remains that if the angle of attack is increased to 20 deg, as might be essential during climb of a missile, pressure-losses would be so large as to reduce engine thrust to 70 per cent of the output at zero angle of attack.

Installation of a full-scale ramjet in the 8ft by 6ft test section of the Lewis supersonic tunnel. The ramjet was performance-checked in the tunnel at 1,100 m.p.h.

These tunnel-test models of supersonic guided missiles indicate the design trends now engaging attention. That both designs are of canard ("tail-first") type is noteworthy.

To provide a missile with certain control advantages, it is desirable to locate the horizontal stabilizing surface at the front instead of at the rear. This breaks up the supersonic-flow field ahead of the missile and the resulting wake disturbances may seriously affect engine performance. Besides being a region of disturbed flow, this is also a general area of reduced pressure. A combination of these losses could result in a considerable reduction in engine thrust at a time (e.g., during the start of a manœuvre) when maximum power was required.

Because such pressure-reduction effects are not a steady operating condition, there is no easy solution to this sort of power-installation problem. The research scientist is faced with a complex assortment of questions requiring complete evaluation throughout the whole range of anticipated flight conditions for several possible power-plant locations. The installation position finally chosen will undoubtedly represent a compromise so as to permit the missile most capably to perform its intended mission.

In installations where the engine is submerged in the fuselage instead of in nacelles, the avoidance of undue thrust losses makes it important to remove the boundary layer that forms along the fuselage surfaces ahead of the engine inlet. The problem is complicated by the variable influence of the bow plane on the boundary layer distribution. Research is under way to determine the best compromise for a fixed removal system and the possible advantages of an adjustable system.

BELL HELICOPTERS IN BRITAIN

APPOINTED sole sales representatives in the United Kingdom, Eire and Holland for Bell helicopters, the recently formed Hordern-Richmond (Sales), Ltd., have offices at the works of the parent company at Haddenham, Bucks, and a northern office at Barton Arcade, Deansgate, Manchester. Hordern-Richmond (Sales) have also arranged with S.N.C.A.N. for the French company to supply all Bell orders from the Hordern-Richmond territory; it was announced in *Flight* last week that the model 47D helicopter was shortly to go into production at S.N.C.A.N.

Hordern-Richmond (Sales), Ltd., will be responsible for the sales, technical administration and sales service of the established products of the parent company. These include a wide range of Hy-du-lignum products, helicopter main and tail rotor blades, test and wind-tunnel fans and laminated compressed wood blades for Rotol airscrews; Hordern-Richmond are also licensees of the Aeromatic airscrew.

A.C. CHANGE-OVER SWITCH

THE cut-out switch designed by Smiths Instruments for the S.E.P.1. Autopilot has been found, in many applications, to be very suitable for use as an automatic change-over switch in the main A.C. invertor circuits supplying 400 cycle, 3-phase current at 115 V to instruments and accessories.

In normal operation, energized by the full supply current, the motor turns a spring-loaded gear until the resistance of the spring balances the drive torque. When this occurs, a contact-breaker arm is set so that a contact is closed. If the supply then decreases, the spring overcomes the motor torque and breaks the contact. Surge in the A.C. supply is overcome by a damper.

The switch-contact actuates a relay in the invertor supply, so that a standby invertor is immediately brought into operation if the main invertor fails. If automatic changing of invertors is not required, the switch can be used to operate a warning light or flag to indicate to the pilot inadequate power supply.

NAVAL AVIATION ARGUMENTS

—in the Commons: "N.A." or "F.A.A."? Coastal Command Crops up Again

DISCUSSION of the future of Naval Aviation occupied a major part of the recent debate on the Naval Estimates in the House of Commons. Particular points of interest included speculation on the future of aircraft-carrier construction, a Government statement on the working arrangement between Coastal Command and the Admiralty, a suggestion that a R.N.V.R. helicopter squadron should be formed, and an almost concerted plea from Members for a reversion to the old description "Fleet Air Arm."

Following the opening statement by the First Lord of the Admiralty, Mr. J. P. L. Thomas (reported in our pages last week) the debate began by MR. JAMES CALLAGHAN, former Parliamentary Secretary to the Admiralty, expressing great doubts on the policy of modernization of carriers. Referring to the modernization of H.M.S. *Victorious* at a cost of many millions of pounds, he said he was not at all sure it would not be better to leave the *Victorious*, *Illustrious*, *Indomitable*, and *Formidable* as they were—with the addition, perhaps, of steam catapults. He thought that, instead, work should be completed on *Powerful*, *Leviathan* and *Hercules*. These ships would then be ready to take the new jet aircraft, while the other carriers would always be available in reserve.

He regretted the lack of information as to the date when some of the present R.N.V.R. squadrons were to be re-equipped. These squadrons were almost as important as the front-line squadrons in the Fleet today; they were the only source from which qualified pilots and observers could be drawn.

He did not expect the First Lord to achieve the re-equipment of R.N.V.R. squadrons in four months, but he thought they should be equipped at the earliest possible moment with the type of aircraft they would have to fly if they were embarked. He recommended energetic action, because R.N.V.R. officers and men were giving 50 week-ends in the year to flying and were doing a first-class job; they ought to have first-class machines.

Referring to the pilot-training arrangements whereby naval personnel were being instructed in America and also by the Royal Air Force, Mr. Callaghan said that although the standards achieved were highly satisfactory he was informed that the total cost was rather high. He thought there was a case for the Navy to do its own training. The Navy should consider, he said, whether it ought not to set up an establishment for this purpose.

Status of Naval Pilots

Recalling his own experience at the Admiralty, Mr. Callaghan said he had discovered that everybody who had anything to do with Naval Aviation was aware of its importance, understood it, and wished to press ahead with it. But he did not think there was a clear conception yet of what should be the rôle of the naval aviator and how he fitted into the Navy generally. One reason for that was that Naval Aviation was truncated. There was control only of the ship-borne aircraft. One could provide a career for a young man for only a certain period of years and the consequence was that at present the man did not know whether he was expected to be a seaman or, as he colloquially put it, "a fish-head." Mr. Callaghan thought the position was being reached where the Admiralty had not only to have good will about Naval Aviation, but had finally to make up their minds.

He asked the First Lord not to hesitate to come to the conclusion, if he felt it proper, that Naval Aviation could not be integrated into the Navy as a whole and might have to be developed on separate lines. The Vote on the Air Estimates would be the occasion to discuss this matter in connection with the anti-submarine command. The issues were difficult, Mr. Callaghan agreed, but the moment had been reached when he had to decide finally which way the air branch was to go.

CDR. R. SCOTT-MILLER drew attention to the position of the Allied air commands, which would need their naval elements of liaison officers. He presumed that before long a Supreme Allied Commander (Mediterranean) would be appointed, with an Allied air commander, and this development might upset the balance of the Royal Navy by tending to pull away those officers who could ill be spared.

MR. J. LANGFORD-HOLT, who used the old designation "Fleet Air Arm" throughout his speech, complained that it suffered from a lack of publicity. While the Royal Air Force spent about £60,000 a year on advertising, the Fleet Air Arm spent only one-sixth of that amount. He thought that, in the matter of recruitment and advertising, the Navy were almost invariably six to eight weeks behind the Royal Air Force. The result was that, he understood, the Royal Navy were getting between one half and two-thirds of the aircrew required. What was needed, he said, was an additional £50,000 from other Admiralty funds specifically for expenditure on recruitment advertising. That would be equivalent to the cost of one and a half aircraft—which could not be manned in any case.

Mr. Langford-Holt went on to say that events had indicated that the short-service commission was not the answer for aircrew recruitment. It was within his own knowledge that at the end of the war probably hundreds of pilots and observers would have preferred to have remained in the Fleet Air Arm if they had been offered any security of tenure. But, of course, they were not. They were told they might stay on for a year, two years or four years, and at the end of that time they might get a permanent commission if found suitable. The result was that large numbers left the Service, causing damage to Air Arm strength that would take many years to overcome.

He criticized the statement by the First Lord that the Government would provide the best aircraft to the Fleet Air Arm. That had never been true; the Air Arm had always been what one might call "the poor man's R.A.F." On the question of supplying aircraft to the Royal Navy, he said the Ministry of Supply performed very little service which could not be dispensed with. He thought the Ministry acted as a brake rather than as a supplier. The Admiralty were also to be blamed, for they were too fond of altering what was known as a staff requirement. They produced a staff requirement for an aircraft which would be needed to perform certain functions. After the requirement had gone to the manufacturer the Admiralty changed the requirement from, say, a two-seater aircraft to a three-seater. That led to an intolerable and impossible situation for the manufacturer. One of the results of this action was that today Barracuda aircraft were still flying in the Navy—though they were rejected in 1943 as unsuitable for first-line duty.

Throughout his speech, as remarked above, Mr. Langford-Holt referred to the "Fleet Air Arm." He commended this description in preference to "Naval Aviation" as an inducement to recruitment. He thought the "Fleet Air Arm" the natural name which was used for a branch of the Service which only received the name of "Naval Aviation" because it was under Admiralty administration. Perhaps the Admiralty felt the use of "Fleet Air Arm" left a nasty taste by reminding them of the days when that branch was part of the Royal Air Force. But, said Mr. Langford-Holt, the three considerations of recruiting, history, and tradition justified reversion to the original term.

MR. EDWARD SHACKLETON, describing the whole position of the supply of naval aircraft as "confusing," said he did not believe the problem could be solved by cutting out the Ministry of Supply. That would lead to grossly uneconomic production of aircraft. But he hoped there would be a greater concentration on established types.

R.N. and Coastal Command

Mr. Shackleton then dealt with the handling of Fleet Air Arm (he, too, favoured the term) personnel—particularly aircrew. During the war it had been the experience that the Navy was so security-minded that when Fleet Air Arm squadrons came into Coastal Command stations they had often been denied essential operational information. Latterly, the Navy decided to appoint intelligence officers to carriers. He wanted to know if this policy was being continued.

Mr. Shackleton then referred to what he called a "plot" by Naval Members to enlarge the career opportunities for the Fleet Air Arm by raising once again the question of the status of Coastal Command. He thought the Parliamentary Secretary to the Admiralty could render a service by denying once and for all that the Admiralty had any intention whatever of pressing for an alteration in the status of Coastal Command. He said this matter caused grave anxiety and, unless settled, would increase the friction which, he claimed, always tended to exist between the Services. Coastal Command and the Navy had a fairly happy relationship today, and he thought any action such as had been mentioned would render a great disservice.

MR. R. T. PAGET said he considered the maintenance of capital ships, including aircraft carriers, totally unnecessary for our defence.

SURGEON-CDR. REGINALD BENNETT—yet another advocate of the term "Fleet Air Arm"—discussed the same point and said he would be interested to discover whether, in fact, it was ever necessary for any new aircraft carriers to be laid down. But he thought the carriers which had been built, or were building, should be kept up at present while the very long-range aircraft steadily became more truly worthy of its name. It was significant, he maintained, that

NAVAL AVIATION ARGUMENTS . . .

the G.R. 17 was equipped to fly on cruising power rather than on the majority of its complete horse-power all the time.

Cdr. Bennett then made the interesting suggestion that there was a strong case for the establishment of R.N.V.R. helicopter squadrons. He foresaw a rapid expansion of the use of helicopters at sea in time of war, especially for anti-submarine work. Having heard that conventional fixed-wing training militated considerably against the techniques required of a helicopter pilot, he thought the formation of special squadrons would allow helicopter pilots to be trained without any of the vast outlay and completely unnecessary and, in fact, contradictory outlay on training them as conventional pilots.

Replying to the debate, CDR. ALLAN NOBLE, Parliamentary Secretary to the Admiralty, said that of the aircraft carriers now in being only the *Victorious* was at the moment committed to modernization. What the future policy would be, both for the carriers on which work is not going on at present and the carriers that would be suitable for modernization was based on a comprehensive plan. There had to be balanced carrier forces, both as task forces of Fleet carriers and as trade protection carriers.

Cdr. Noble said he preferred to use the term "Naval Aviation" as he thought it fitted in with what the First Lord had said—that aviation was now an integral part of the Navy, and they did not want people to think of it as a separate arm.

The aircrew position was better, he added. Advertising had done a great deal of good and it was remarkable to see the graph of how applications went up after it started. But there was still a long way to go, and a 50 per cent increase was needed over the present intake.

The Parliamentary Secretary then dealt with the question of Coastal Command and Naval Aviation. After the war, following Departmental discussions, there was an agreement between the Admiralty and the Air Ministry on what should be done. Briefly, it was that the Navy was recognized as normally the predominant partner in combined sea-air operations. The total strength of the maritime arm of the R.A.F. was determined by the Chiefs of Staff or higher authority, and its allocation to the various theatres was a matter for Admiralty and Air Ministry agreement. Everything possible was being done to achieve co-operation at all levels.

There was a joint sea-air warfare committee which was set up to go into questions concerning both the Services. There was also the joint A/S school at Londonderry.

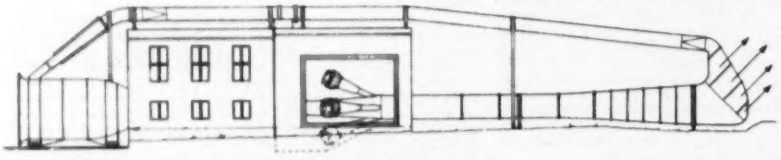
The Admiralty's position was that, should either party to the agreement wish to revise it, it was open to them to start discussions. If the proposed change was a major one it would be for the Government to decide.

Cdr. Noble added that the Admiralty had not so far asked, and were not at present asking, for any such change.

Commenting that he had to choose his words carefully, he said, "In any such future consideration the Admiralty would need to take into account not only the arguments of principle, for and against a fundamental change in the administration of maritime aircraft, but also the large practical problems which would be involved if the decision should be in favour of such a change. At the moment we have a good many pre-occupations in getting on with the rearmament programme as fast as we can with the resources available."

A "FOUR WINDS" TUNNEL

Quartet of Goblins to Operate New Saab Subsonic/Supersonic Installation



General arrangement of the four-Goblin wind tunnel. The fourth turbojet is, of course, on the far side of the main extractor duct.

A NUMBER of projected designs for wind tunnels have appeared in recent years in which a standard aircraft turbojet is used to provide the desired airflow. This system commonly makes use of the "ejector" principle, whereby an airflow or liquid with high velocity can be made to promote a greater mass-flow at a slightly reduced velocity.

When a turbojet is used in such a manner, care has to be taken to preserve representative operating conditions at the tailpipe; engine temperatures can rise rapidly if any restriction is placed in the tunnel into which the engine exhausts.

One of the first large-scale tunnels actually to be built on this principle is now under construction at the Saab Aircraft Company's works at Linköping, Sweden. Designed for operation at supersonic or high subsonic speeds, it will be used both for fundamental transonic research and for the development of new aircraft types.

The tunnel has been built under contract to the Royal Swedish Air Force. The engine cell and test house were finished last year and work on the tunnel itself has continued during the winter; the complete installation should be ready for use very shortly.

Four de Havilland Goblin turbojets—probably taken straight from the Saab assembly-line—are fitted at 90-deg intervals around the "exhaust" section of the tunnel, into which their efflux is injected at an angle of about 30 deg to the tunnel centre-line. Main engine combustion air is drawn in from each side of the engine cell through large rectangular screens.

The tunnel air, induced by the turbojet exhaust, enters at a bell-mouth, the interior of which is tapered to accelerate the air and reduce the pressure. The air traverses the working section, which is the length of minimum cross-section, and then enters the expanding exhaust pipe. Here, it mixes with the efflux from the Goblins and is then allowed to return to atmospheric pressure in a diffuser before being finally expelled through an outlet swept up at 45 deg. Condensation in the low-pressure inlet funnel is prevented by pre-heating the intake air; this is achieved by tapping a small proportion of the tunnel efflux and leading it back to a heat-exchanger in the intake.

The utility of such a tunnel is greatly increased if a number of different test-sections can be inserted. In the case of the Saab tunnel, two different working sections have been made; for subsonic work, a section 3.3ft by 2.3ft is employed while the supersonic insert is 2.3ft square in section.

NEW BRITISH STANDARDS

THE British Standards Institution has published an addendum and specifications covering requirements for steels for the manufacture of aircraft bolts by cold forging. The Standards concerned are: S.102—carbon-molybdenum steel (wires only for the manufacture of cold forged bolts of ½ in shank-diameter and over); S.103—low nickel-chromium steel (wires for the manufacture of cold forged bolts of ½ in shank-diameter and over); S.105—carbon steel (wires only for the manufacture of cold forged bolts not exceeding ½ in shank-diameter).

Copies of these standards may be obtained from the British Standards Institution, Sales Department, 24 Victoria Street, London S.W.1, price 1s each, post free.

Another standard published (price 1s.) is B.S. SP.47 : 1952, for single-coil spring washers for aircraft, while a further addendum (available free of charge) is No. 1 to B.S. 1161 : 1951; it takes the form of notes on aluminium and aluminium alloy sections.

Other new specifications recently announced include three items, B.S.G. Nos. 137-9 : 1952, respectively referring to extra-low voltage D.C. flashing units for aircraft navigation-light systems; low-voltage ram-air pressure switches; and simple aircraft dashboard clocks. These three standards are priced at 1s each. In addition, B.S. 1791 and 1815, relating to cotton-covered and enamel/cotton-covered round copper wires, have been issued at 2s. each.

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MIDDLE EAST GATEWAY

Khalde Airport, Beirut, "Builds Big" for a Promising Future

By DUDLEY OSBORNE

A general view over the taxying area, with concrete maintenance hangars in the foreground. Towards the left is the temporary control tower.

SINCE "Black Saturday" (January 26th) when riots at Cairo's airport caused some international operators to re-route services through Beirut, the international airport of the Lebanon, Khalde, has acquired rapid importance as an aerial gateway to the Middle East.

The sudden jump in aerial traffic, caused by the Cairo events, concentrated into a few hours what Lebanese civil aviation authorities and many airline people confidently foresaw, Beirut's logical rôle as a Clapham Junction for Asia. Some indication of the contrast in traffic volume since the beginning of February can be illustrated by B.O.A.C.-Qantas figures alone. From one service a week on the London-Baghdad route, Beirut now takes eight services weekly eastbound, and the same number westbound. In addition, Pan American, Air France, Panair do Brasil, Middle East Airlines, Misrair, Iraqi Airways, Iranian Airways, S.A.S., K.L.M. and T.W.A. operate regular services through Khalde.

A remarkable feature of Khalde airport—so authorities there told me when I visited Beirut recently—is that less than two years ago it didn't exist. Started on July 1st, 1950, this huge project now approaching completion is all the more creditable because it has been built in such a short space of time in a part of the world not particularly conspicuous for its speed in public works.

Khalde's commandant, Mr. Zouhair Beydoun, told me that total expenditure on the airfield, facilities and terminal building will be about £5,000,000. Two concrete runways in the shape of a "V", are each approximately 2,600 yards long, and their surfaces are 10in think. The huge aprons cover an area of some 1,076,000 sq ft. Two V.H.F./D.F. beacons are on order, and I.L.S. will be installed shortly on the prevailing-wind runway. Runways, taxi tracks and aprons are completed.

Mr. Beydoun, who is also Deputy Director of Civil Aviation, told me that it was not intended to instal G.C.A. "Because of Khalde's position at the water's edge, and the Lebanon's climate, we have never had a diversion," he said. Like the Windmill Theatre in London, Khalde has never closed.

The present control tower is a wooden structure built up above the ground, rather like a packing case on stilts; the new tower, built above the big 220-yards-long terminal building, will be the equal of any in Europe. I.C.A.O., who have regarded the Khalde project rather as a pet, have co-operated with the Lebanese authorities in obtaining the best equipment available in the U.S. or Europe. Air-traffic control officers and meteorological staff, all of whom are Lebanese, have trained in either the United States or in France.

A Pan American representative told me that his company were establishing their Middle East headquarters in this ancient city. The official, Mr. G. P. Wilson (district traffic manager) said: "We believe that Beirut is the logical centre for travellers to the Holy Land, and to Asia." He added that the increasing number of oil companies who were transferring their headquarters to the Lebanese city indicated commercial confidence in Beirut's progress.

Pan American's president, Mr. Juan Trippe, had arrived the same day to inspect the site of a vast modern building which the company and their associates, Middle East Airlines, intend to build in the centre of the town.

Without wishing to comment on the political affairs of a neighbouring Moslem country, Mr. Beydoun told me: "Cairo is well situated geographically for North-South traffic. But, for the same reason, Beirut must then become the logical staging post for east-west air traffic passing from Europe and the U.S., to the Middle East and Asia. We intend to do all we can to keep the world's airlines coming through our country."

The general opinion is that Cairo, even provided there is no recurrence of "Black Saturday," will regain only a part of the traffic which formerly went through there.

A pleasing combination of classic Eastern architectural style and the modern "functional" look, Khalde's big new terminal building is approaching completion. On the right is Mr. Sami Shoucair, Lebanon's Director of Civil Aviation.

SHORT-HAUL AIR TRANSPORT

Basic Considerations and their Translation into Practical and Economic Operations

THIS article is composed of selected abstracts from a paper given recently before the Royal Aeronautical Society by Mr. Peter W. Brooks, B.Sc., A.C.G.I., A.F.R.Ae.S. In fairness to the lecturer, it should be made clear that only certain of the more practical sections of the paper are reproduced here: omitted, for example, are some long and detailed historical studies. The original work, which was profusely illustrated, was reminiscent in its thoroughness, and accuracy of detail, with the classic papers written from time to time by the chief executive of B.E.A.: but perhaps this is not surprising, for Mr. Brooks is Mr. Masefield's assistant and evidently maintains the tradition.

TYPE OF NETWORK	SPOKE		GRID		LINE	
TYPICAL ROUTE PATTERN						
AIRCRAFT & CREW UTILISATION	DIFFICULT		EASIER	✓	EASY	✓
TRAFFIC FLOW THROUGH STATIONS	LOW EXCEPT AT HUB		HIGH	✓	LOW	
ENGINEERING	CENTRALISED	✓	DISPERSED		TERMINAL ONLY	
NIGHT STOPPING AND CREW SLIPPING	COSTLY		CHEAPER	✓	COSTLY	
BAD WEATHER	SERIOUS IF AT HUB		LOCALISED EFFECT ONLY	✓	SERIOUS AT ANY POINT	
MOVEMENT CONTROL	EASIER	✓	COMPLEX		EASY	✓
SALES EFFORT	CONCENTRATED	✓	DISPERSED		DISPERSED	

Route Network Classes: This diagram shows some of the problems and advantages of three types of network; the "spoke," "grid" and "line."

THE organization of the world's airlines, the types of their equipment, forms of route network, lengths of stage, density of traffic, ground facilities available, standards of service and rates charged—all these vary widely and sometimes in an unrelated manner. In spite of these divergencies, their activities are governed by the same general principles and it is possible to classify them into four broad types: long-haul, long stage over 2,000 miles; long-haul, medium stage, 1,000-2,000 miles; short-haul, 200-1,000 miles; and feeder, under 200 miles. Such a classification cannot be rigid but it does help to show the basically different problems of the various types of operation. These may be for the carriage of passengers or freight—or, as is usually the case, of a combination of both.

Another fundamental of air transport which influences an airline's mode of operation and its economic results is the type of route network. Again, it is difficult to place every operator into any one group, but most route patterns have an affinity with one of three simple types. These are: the "spoke" network—of which B.E.A.'s operations are an example; the "grid" network —such as that of Eastern Air Lines; and the "line" network —of which British Commonwealth Pacific Airlines is a classic example.

The various types of operation and route network, together, whatever the character and volume of traffic carried, constitute the primary operational problem. Within the limits set by their varying influences, it is possible to distinguish a uniform basic pattern in the administrative structure of all air-transport undertakings. All airlines can be regarded as having two productive divisions each of which has two merging roles: the Technical and Operational and the Traffic and Commercial. In other words: making the aircraft available and flying them, and handling the traffic after finding it.

For most airlines each of these functions is discharged by one or more departments which are supported by ancillary departments responsible for: finance and economic control and staff and property.

The technical, operational, traffic and commercial rôles of an airline are the directly productive side of its activities. The technical and operational rôles take in: procurement of aircraft, other equipment and stores; aircraft maintenance, overhaul and inspection; flight operations; movement control; space and reservations control; traffic handling. Traffic and commercial divisions are responsible for such matters as sales and sales promotion and advertising.

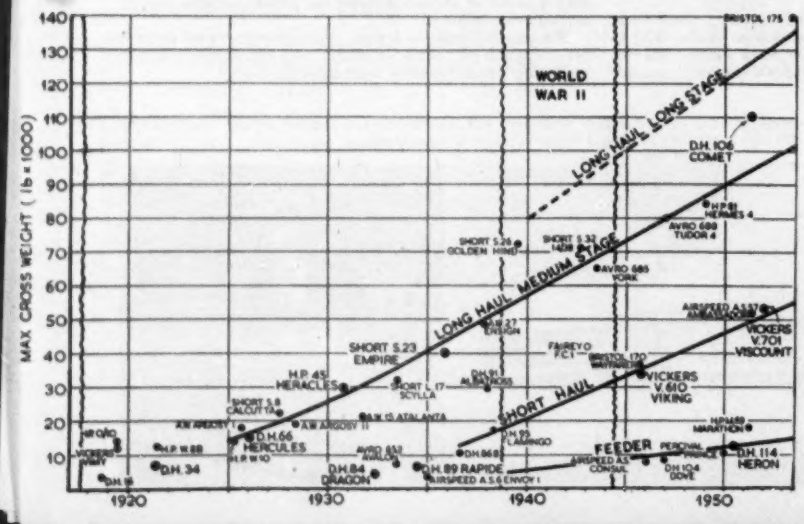
These functions follow from each other and interlock. At the top of the list the aircraft are made available; at the bottom the traffic is attracted. The aircraft, provided by the engineering side of the airline and operated by the flying staff, are controlled from day to day by movement control to schedules agreed with the traffic and commercial sides of the organization. The traffic, attracted by advertising and acquired by sales, is handled by the traffic handling organization and integrated by space and reservations control into schedules agreed with the technical and operational division.

Thus, the schedules—applied by movement control and exploited by space and reservations control—are the centre of the airline's productive effort. The effectiveness of this scheduling, more than any other single factor, governs an operator's efficiency.

The administration of the stations on an airline's network is additional and outside the structure already described. Administrative control of staff at stations is usually vested in the traffic department because the majority are traffic personnel.

The form of organization is particularly important to the short-haul and feeder operator. An efficient and economic structure is essential to counteract the basically more costly nature of short-sector services.

The development of the vehicle has been, and remains, the controlling factor in the progress of air transport, for the possibilities and limitations of the vehicle prescribe what is attainable in all forms of transport at any given time.



Transport Aircraft Weights Increase: The increase in the all-up weights of British transport aircraft are seen here rising from the 4,750 lb of the D.H. 16 (1919) to the present-day 105,000 lb D.H. 106 Comet, and the even heavier Bristol 175 now under construction.

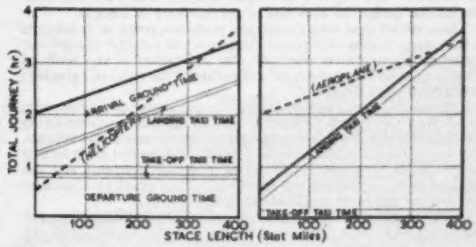
In 1930, developments in the United States led to changes in airframe and power-plant design which started a revolution in the growing industry. The new American design philosophy not only incorporated a more modern structure and a more refined aerodynamic form, but it also included a number of other vital design improvements—flaps, retractable undercarriages and variable-pitch airscrews.

The Boeing Monomail of 1930 was, perhaps, the first aeroplane of the new era. It had a cantilever low wing with a smooth stressed duralumin skin. Although a single-engine type with accommodation for only six passengers it had a retractable undercarriage and led directly to the Boeing 247 twin-engine ten-passenger transport of 1932. The Douglas Company's reply was the DC-1, soon developed into the 14-passenger DC-2 of 1933 and its famous successor the 21-passenger DC-3 of 1935. (B.E.A. now gets up to 32 passengers into its Pionair DC-3s.)

These aircraft pioneered short-haul air transport as we know it today. With them the American internal airlines expanded rapidly and led to the evolution of air transport as a stable, and gradually more profitable industry.

The early 1930s also saw a new and significant development in this country. Until this time transport aeroplanes had tended to grow larger, more elaborate and more powerful as knowledge of aircraft design progressed. From about 1931, however, small companies began to start up internal airlines. Their needs led to the development of a new class of small, cheap-to-operate transport aeroplane of which the de Havilland Dragon of 1932 was one of the first and most successful examples. The British aircraft industry soon made this class of aircraft a British speciality and this country has maintained its lead in this field to the present day.

For the short-haul routes in Europe in the later 1930s Imperial Airways ordered the de Havilland Albatross and Armstrong-Whitworth Ensign four-engine monoplanes. The war prevented these types from justifying their promise, and it also caused the cancellation of two newer designs, the Short 14/38 and Fairey FC-1, which were ordered in 1938. These were a "lost generation" in the development of British transport aircraft, the effects of whose loss are still very much with us today.



Fixed-wing aircraft v. helicopter: Comparative breakdown of normal aircraft and helicopter air travel times over stage lengths of up to 400 miles.

Their contemporary in America, the Douglas DC-4 prototype, first flew in May, 1938. Seen against the rapid progress of the American domestic operators using the by then well-established DC-3, it created a great impression. As it turned out, it did not appeal in its original form to the American operators, but a re-designed slightly smaller version—the DC-4A—flew in April 1942 and was an immediate success.

After the Americans had entered the war a military transpor version of this aeroplane was built and, like the DC-3, was used fo military purposes on an enormous scale. The DC-4 was the first design to the modern four-engine formula, just as the DC-3 before it had been the first to establish a lasting design philosophy in the two-engine class. It is not too much to say that these two machines, in their respective categories, set world air transport on its feet.

In the United States since the war, the Convair 240 and Martin 2-0-2 and their developments have continued the DC-3 formula. The DC-4 has been followed by the first truly long-stage transports—the Lockheed Constellation, Douglas DC-6 and Boeing Stratocruiser.

In this country, in 1943, the Brabazon Committee was set up by the Government of the day to examine British requirements for post-war transport aircraft. Amongst other types, two short-haul aircraft have resulted from its recommendations.

The de Havilland-Airspeed Ambassador and Vickers-Armstrongs Viscount are now in production and are coming into service on B.E.A. routes this year. Two feeder aircraft also grew from Brabazon Committee specifications—the de Havilland Dove and the Handley Page Marathon.

Today, this country has the opportunity of assuming world leadership in the manufacture of transport aircraft. The Bristol 175, de Havilland Comet and the Vickers-Armstrongs Viscount can become pre-eminent in each of the three more important categories. There is no reason why we should not maintain our long-established lead in the fourth (feeder) class also. By her efforts since the war Britain has gained herself a great opportunity. This can only be exploited by production in adequate numbers and by energetic further development.

We must hope that, in spite of the calls of defence, both these essentials can be met. While production is the basic problem facing the whole aircraft industry, development is, perhaps, a less obvious necessity. Its importance is shown by American experience.

The Americans have achieved their leadership in large transport aircraft as much from their continuous "stretching" of a few successful basic designs as from any inherent quality of those original designs. We must adopt the same policy in this country.

Another field in which this country has a great opportunity is in the application of the helicopter to transport purposes. The helicopter is as well suited to transport requirements in Britain as the aeroplane is to the geography of the United States.

On internal services within the British Isles the aeroplane suffers from the fundamental disadvantage that sectors are too short for the air travel time between city centres to show any very striking advantage over our highly developed surface transport system. Only on sea crossings does the air journey offer any substantial saving but, unfortunately, most of such routes suffer from a preponderance of highly seasonal tourist traffic.

Because of these factors, transport by aeroplane inside this country will never assume the proportionate volume or importance of air transport in such places as the United States or Australia. At best, it can perhaps be made to pay its way on the trunk short-haul services.

Promise of Helicopters

All this emphasises the need to press forward with the commercial helicopter. The helicopter, when further developed, promises to be no worse economically than the aeroplane while offering a complete solution to the problem of reducing journey times on short sectors. To come into its own the helicopter must, as a start, achieve standards of reliability, regularity and punctuality comparable with those already attained by the aeroplane. In the long run, it must aim to be at least as independent of weather conditions as competing surface transport.

B.E.A. has appreciated the importance of the helicopter to this country and has been preparing for some time to go over to this new vehicle on the majority of routes of less than about 300 miles as soon as development of the aircraft makes this possible. To gain essential operating experience, the B.E.A. helicopter experimental unit has been busy for the past four years running experimental services. On the basis of this experience, B.E.A. is planning to introduce the Bristol 173 twin-engine helicopter into service in 1954. In addition, the Corporation has recently issued a specification for a 35/45-passenger helicopter for service from about 1960.

Air transport is a commercial activity and one that—at least in its long- and short-haul form—can be made economically self-supporting. To make it so, however, requires skilful management, the right equipment and an organization appropriate to the operating task. Also needed are ways of controlling both day-to-day progress and longer term development in the light of changing traffic requirements and varying economic conditions.

Beyond and above the practical aspects of commercial, operational and engineering control, the management of an airline requires an overall picture of what is happening and—even more important—must be able to see the economic implications of what is done. This means that it is necessary to have at head office a sufficiently accurate picture of costs and revenues, broken down under suitable headings, for those responsible to be able to draw conclusions from trends and then act upon them in good time.

This time factor is important. Air transport is a modern activity; it is volatile and dynamic in character and shows this in the way it responds to varying conditions and changing circumstances. This is particularly true of short-haul operations. To be effective, day-to-day control must be based on a system of information which works both promptly and continuously.

A most important feature of such a system of information is the cost breakdown on which it is based. The breakdown we are using in B.E.A. has been evolved from that originally advocated by Mr. Masefield in his 1948 Commonwealth and Empire Lecture and intended originally to provide convenient and realistic cost approximations on which to base economic comparisons of aircraft types. The basis of the method was twofold. First, it introduced the conception of three kinds of cost—the basic annual costs (overheads), the variable costs related to hours flown and the variable costs related to the number of landings made. This third factor, the take-off and landing costs, was new. Its introduction brought into air transport costing for the first time the full effects of stage length.

Second, it related different cost items to the factors influencing them more completely than had been attempted before. Previous

SHORT-HAUL AIR TRANSPORT . . .

airline costing methods had evolved very largely from American railway practice and related costs to ton-miles as the single basic unit. It is interesting that, very soon after Mr. Masefield made his suggestions for a change, the American Interstate Commerce Commission published a report on railway costing procedures in which they advocated a similar alteration in the treatment of railway costs.

An interesting feature of the B.E.A. cost method is the introduction of a breakdown into aircraft, airline and promotional costs. These sub-divisions have extended the utility of the developed method beyond those of purely airline costing to cover more effectively the purpose for which the original "Commonwealth and Empire" method was evolved. Purposes also served by the American A.T.A. and British S.B.A.C. cost formulae.

The aircraft costs of the B.E.A. method—like those produced by the A.T.A. and S.B.A.C. methods—can be regarded as those relating directly to the aircraft type and are therefore useful for analysis and assessment of the economics of different aircraft. There is a good deal of practical evidence to support the figures arrived at by the B.E.A. method.

The most important application of a costing method used for control purposes is in the rapid presentation of information for short-term management decisions. We have come to the conclusion in B.E.A. that for short-haul and feeder operations this must be done on a route basis. We accordingly examine the results of each route separately and summarize its progress in graphical form.

For most control purposes it is unnecessary—and can, indeed, be misleading—to consider the airline's overheads in the route picture. Instead, critical route operating costs or marginal costs are used. The C.R.O. costs comprise the variable costs of the route plus the basic aircraft costs—the standing charges of the aircraft used. The C.R.O. costs can be regarded as those that must be covered by revenue if the route is to contribute over a period to the airline's overheads. In other words, they are the costs that must be covered to justify operating anything more than purely *ad hoc* services. The latter are justified if marginal costs are covered. That is, if the immediate costs of each service are less than the revenue earned by that service.

Such a presentation of information about each route enables head office to visualize the complete operating picture and to decide quickly when to shift an emphasis of effort, how to economize, where to expand. It provides an essential basis for effective airline management.

TWO BLACKBURN APPOINTMENTS

Mr. L. Maxwell

FROM Blackburn and General Aircraft, Ltd., comes news that Mr. Leslie Maxwell has been appointed general manager of their northern unit, Blackburn (Dumbarton), Ltd. Mr. Maxwell was for 12 years with Short Brothers and Harland, Ltd., where he began as a foreman and attained the office of development manager. In 1946 he joined the Hindustan Aircraft Company, of Bangalore, as joint general manager; here he was responsible for Dakota overhauls, Prentice production and the recently implemented Vampire project. He became general manager of the Egyptian Government Aircraft Factory in 1950, at that time producing Vampires.

Another appointment within the Blackburn organization is that of A-V.M. H. N. Thornton, C.B.E., as a director of Universal Flying Services, who operate the Fairoaks Aero Club. Universal Flying Services are a subsidiary of Blackburn and General Aircraft, Ltd. A.V-M. Thornton, whose flying career started in the R.F.C., held a number of air attaché posts from 1935 onwards; during the war he served in Bomber Command, in South-East Asia and, eventually, in B.A.F.O.

ALL DONE BY AIR PRESSURE

IN contrast to previous stall-warning equipment—which has usually been operated by deflection of a small wind-vane—the stall-warning indicator marketed by Kelvin and Hughes, Ltd., is dependent upon a pressure difference.

Designed in conjunction with Mr. Robert Youngman and the Ministry of Supply, the indicator houses a sensing element of two aneroids; one of these is connected to the pitot static tube while the other is piped to a vent in the wing lower surface at 10 per cent chord. The capsules are attached to a pivoted beam so that, in normal flight, the beam is in equilibrium.

As the angle of attack of the aircraft approaches the stalling value—whatever the air speed—the increased pressure imposed on the capsule vented to the wing under-surface causes the beam to move sufficiently to close a pair of platino-iridium contacts which operate the relay.

The relay, which operates at 24 V and can carry up to 8 amp, may be used to light a lamp or actuate any suitable warning device. The pre-set pressure-ratio at which the indicator operates has been found to be constant for a given aircraft type, irrespective of the kind of stall which occurs. It varies between different types of aircraft; the indicator can be pre-set over a wide range to suit the needs of any installation.

The company state that the instrument has proved completely reliable during tests carried out in the air and on the ground. An example is to be shown at this year's exhibition of the Physical Society, opening at Imperial College, London, on April 3rd.

Also shown by Kelvin and Hughes at this exhibition will be a new altitude-operated switch, consisting of an evacuated capsule operating a snap-switch at a predetermined outside pressure. The switch is designed to operate at various levels between 30,000ft and 40,000ft, whether the aircraft is ascending or descending.

At 24 V, breaking and making currents of 0.5 amp and 5 amp respectively are quoted by the makers, who give the temperature limits as —40 to + 60 deg C. No indication is given of the eventual circuit in which this switch will be used.

SERVOMECHANISMS

SEVENTEEN reports covering the theory, design and operation of servomechanisms from Vol. 5 of *Selected Government Research Reports*, were published recently under the title *Servomechanisms*.* The reports have been selected from research work carried out under the direction of the Ministry of Supply.

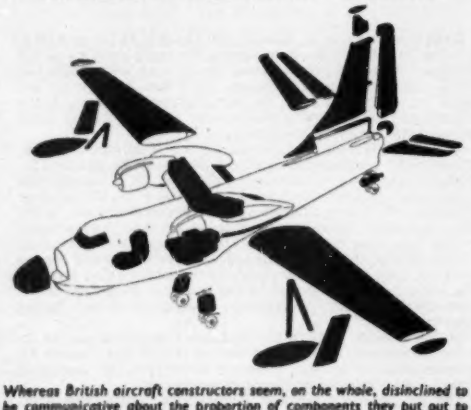
Those which deal with theoretical problems cover such subjects as the interpretation of Nyquist Diagrams, the solution of algebraic equations by graphical methods, the evaluation of the roots of quartic equations and the rapid evaluation of the roots of equations of fifth and sixth degree.

The design of such components as the velodyne, quick-response, sense-detecting rectifier circuits, smoothing and re-transmitting mechanisms and aided laying systems is considered in the volume.

The effect on the efficiency of servomechanisms of such factors as the presence of air in the oil of hydraulic systems and the linearity of the voltage/speed characteristics of small D.C. generators used as tachometers is also dealt with.

* *Published by H.M. Stationery Office for the Department of Scientific and Industrial Research. Price £3 3s (*$13 *in U.S.A.); by post, £3 3s 7½d.*

SPREADING THE LOAD IN AMERICA



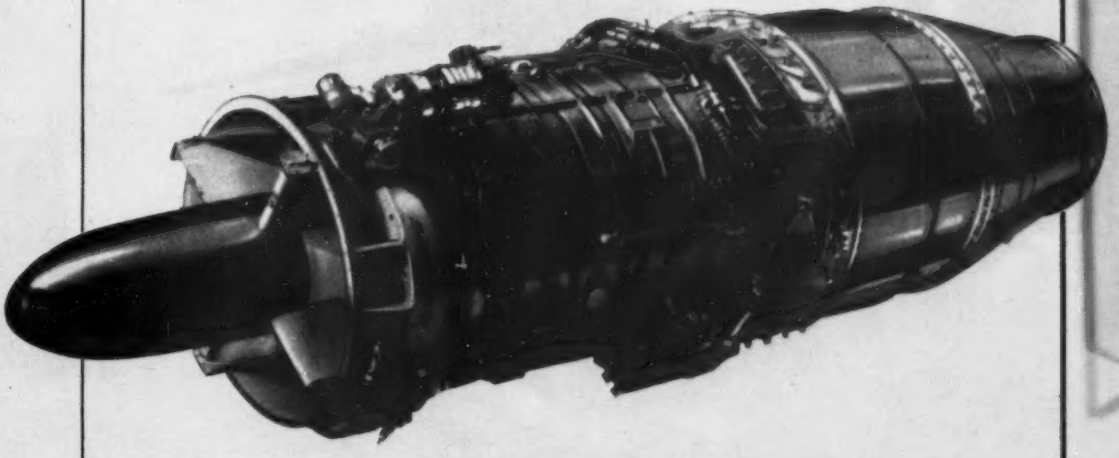
Whereas British aircraft constructors seem, on the whole, disinclined to be communicative about the proportion of components they put out to sub-contractors, American firms publicize such contracts widely. Glenn Martin have recently issued this "exploded" view of a Martin P5M-1 flying-boat, showing (in black) the parts now being manufactured by other firms. The boxes seen on the beaching chassis are flotation tanks.

Power potential

In its progressive programme of power development the Armstrong Siddeley Sapphire—the most powerful aircraft engine in the world—has completed a 150 hours type test at a rating of

7,500 lb thrust *(subject to official confirmation)*

A major contribution to the defence of the free world, it is now being manufactured on both sides of the Atlantic.



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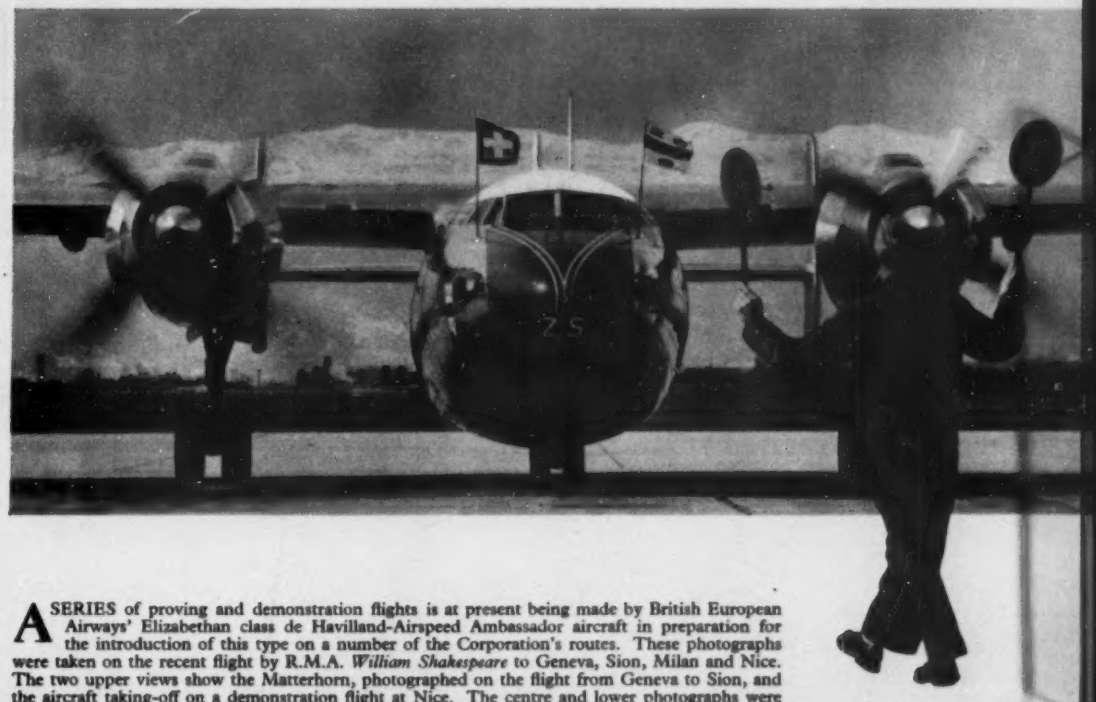
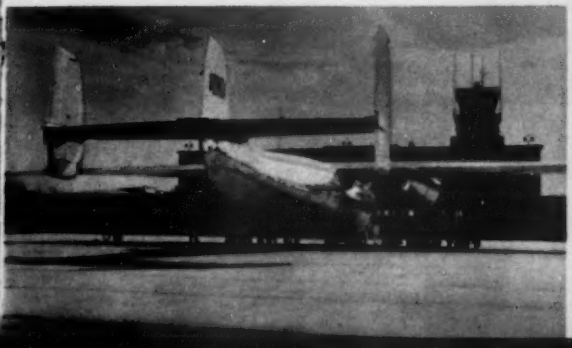
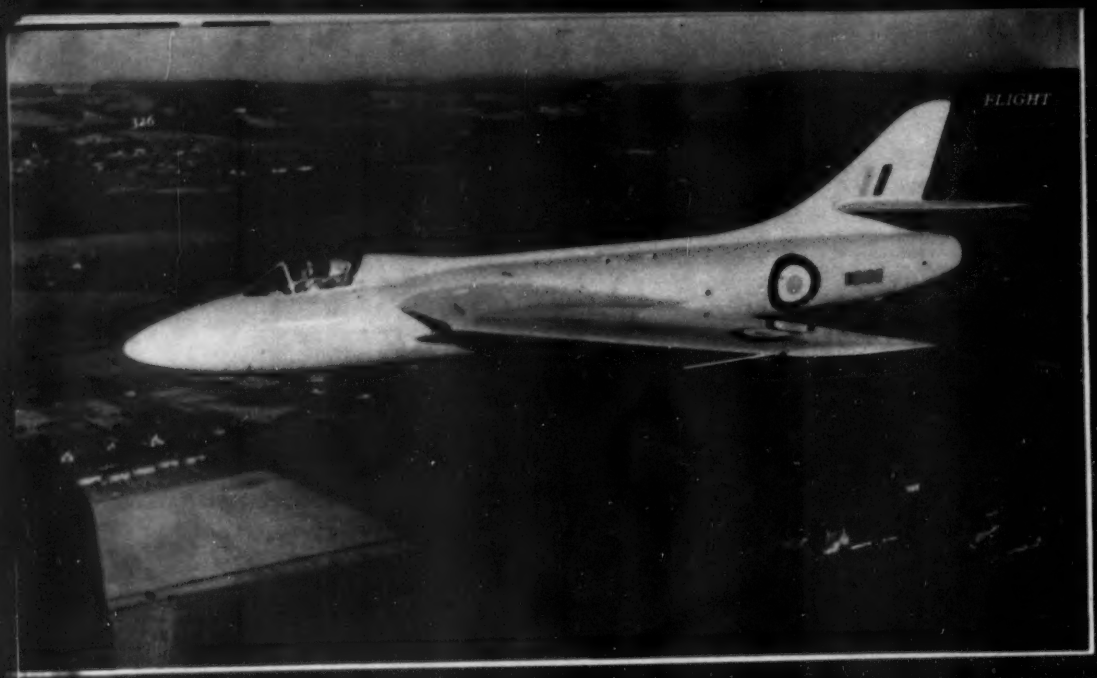
Elizabethan Shows the Flag



A SERIES of proving and demonstration flights is at present being made by British European Airways' Elizabethan class de Havilland-Airspeed Ambassador aircraft in preparation for the introduction of this type on a number of the Corporation's routes. These photographs were taken on the recent flight by R.M.A. *William Shakespeare* to Geneva, Sion, Milan and Nice. The two upper views show the Matterhorn, photographed on the flight from Geneva to Sion, and the aircraft taking-off on a demonstration flight at Nice. The centre and lower photographs were taken at Geneva's Cointrin Airport and in two of them the Elizabethan can be seen wearing the flags of Switzerland and of B.E.A. Elizabethans are at present working certain of the London-Paris services and B.E.A. will also introduce them on the following routes : London-Nice (night excursion services from May 1st and daily morning flights from August 1st); London-Milan *via* Geneva (daily in under four hours); London-Rome (from the end of June); London-Copenhagen-Stockholm (from July); and London-Zürich-Vienna. A proving flight, with the Elizabethan G-ALZR, R.M.A. *Sir Walter Raleigh*, was made over the London-Zürich-Vienna route on March 11th-12th.

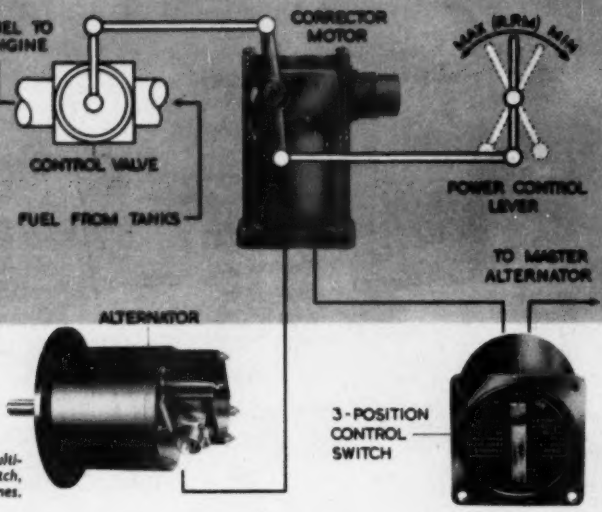



FLIGHT

THE morning air above the South Coast has the tang of the sea about it. Below, the winter sun throws long shadows from the trees across the meadows, and arrow-like into this setting flashes a pale-green monoplane having the beauty of nature itself. Indeed, in the symmetry of its form lies the secret of its astonishing speed. It is the Hawker P.1067 intercepter, powered with a Rolls-Royce Avon, and the Lombard-helmeted figure in its ejection seat—clearly visible in one of these "Flight" studies—is S/L. Neville Duke, D.S.O., D.F.C., the constructors' chief test pilot.

BREATHING ENGLISH AIR

FLYING IN STEP



Equipment for one turbojet of a multi-engined aircraft; the three-position switch, of course, serves to control all engines.

Automatic Synchronization of Engines: New Rotol Equipment Described

IT has long been appreciated that synchronization of speed between the power plants of a multi-engined aircraft confers numerous advantages. Chief of these is, probably, a reduction in crew and passenger fatigue, brought about by eliminating "beat" vibration; and a secondary improvement is obtained by holding all power plants to closer operating limits, with advantages in both economy of operation and length of useful life.

Pilots have usually tried to obtain synchronization by careful engine control, relying upon their ears for determining when the "on-speed" condition was reached. It will be realized that this operation can, at best, be only an approximation in which the beat frequency is progressively reduced.

Help in arriving at the synchronized state was given by the introduction of engine-driven synchroscopes; these instruments do not, however, perform any function other than to provide the pilot with a ready indication of which engine, or engines, may require further adjustment. Although this relieves the pilot of much experimenting, and renders synchronizing a quicker operation, the necessity of repeating the operation at fairly frequent intervals remains.

In order to provide an automatic synchronizing system, Rotol, Ltd., of Gloucester, filed a patent in 1939 outlining the essentials of such a system, and the firm has been steadily developing it ever since. It may be pointed out that the principle employed is applicable to any pair of rotating shafts, and is not restricted to aircraft power plants.

The Rotol automatic synchronizer consists of an engine-driven alternator and a corrector motor (both repeated for each power plant), plus a control switch. These units are illustrated in the accompanying drawing.

The alternator, which may be fitted to any convenient point of the engine, is a three-phase machine operating at a nominal 30 volts. The use of A.C. makes the motor suitable for use as a remote speed-reference; in addition to the synchronizing equipment, three tachometers can be driven from the alternator, if necessary. The alternator rotor is of the permanent magnet type; this eliminates brushgear and slip-rings, and both improves altitude performance and removes radio interference. The alternator weighs 5 lb and is designed for use at speeds up to 6,000 r.p.m.

The corrector motor incorporates two three-phase stator windings mounted in conjunction with two squirrel-cage rotors fitted adjacent to each other on the same shaft. One stator winding is connected to the alternator of the "master" engine, while the other stator is fed from the alternator of the engine to which the corrector motor is fitted. The two stator windings are in opposition, so that any variation of input frequency between the windings will cause rotation of the coupled rotors, at a speed proportional to the difference in stator input—which is itself proportional to the difference between the speed of the master and slave power plants.

Rotation of the rotor shaft drives a layshaft *via* a non-reversing worm gear. This layshaft carries an eccentric which serves as a fulcrum for a link in the control from the pilot's airscrew-speed lever to the C.S.U., or, on a turbojet aircraft, for a link in the control from the main power lever to the fuel-metering valve. This provides a form of vernier adjustment of engine speed of a sufficiently fine order to permit almost perfect matching of rotational speed. When the slave engine is running at the same speed as the master, the input to the two stator windings of the corrector motor will be equal and no resultant torque will be applied to the rotor shaft.

The present types of corrector motor provide for a maximum synchronizing adjustment of ±6 per cent to be made; an eccentric-operated leaf-switch returns the layshaft to a datum position when the synchronizer is switched off.

The pilot's control panel carries a small on-off switch, with two positions for twin-engined aircraft, and three for multi-engined types—the extra position enables either of two power plants to be selected as master.

A further item of equipment, which is necessary only on very large aircraft, is a power-factor correction unit. The synchronizer circuit is essentially inductive, and the loss is considered sufficient with higher loads to warrant the introduction of a capacitance to improve the power factor and reduce power consumption.

It is assumed that synchronization will be required only during periods of fairly steady cruising. Take-off and climb will therefore be made with the equipment inoperative. When the pilot wishes to synchronize the engines, he has merely to adjust the engine and/or airscrew levers to the desired settings and switch on the synchronizer. The master engine will usually be No. 1 on a twin-engined aircraft, or No. 2 if four engines are involved. Any engine running faster, or slower, than the master will automatically be brought into line within ten seconds, provided the original discrepancy was less than six per cent. If one engine is running well below the speed of the others, the synchronizer cannot make up all the difference, but the pilot should be able to set all engines to a much finer degree than ±6 per cent before using the equipment.

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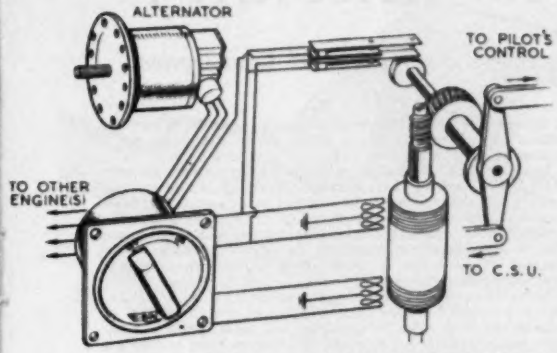
FLYING IN STEP...



"Exploding" the corrector motor shows the rotor drive and the limit-switch. This diagram assumes an aircraft powered by two piston engines.

When it is desired to alter the settings of all engines, the pilot operates engine-power or airscrew controls in the conventional manner. The synchronizing equipment is rendered inoperative during the change in speed, but will once more take effect when all power plants have settled down to the new setting.

In the event of the master engine failing on a multi-engined aircraft, the pilot's switch can be turned to select No. 3 engine as an alternative master; if the aircraft is a twin, of course, synchronizing would no longer apply. In any case, the corrector motor limit-switches prevent the slave power units from following a defective master engine beyond the 6 per cent range.

Over 2,000 hours' flying has shown the Rotol automatic synchronizer to be virtually trouble-free. The equipment is independent of any external source of electrical power, and the absence of slip-rings, brush gear, commutators or relays should greatly reduce the number of occasions upon which adjustment or replacement of components would be needed. Rotol, Ltd., make the claim that the servicing requirements of an aircraft are not increased by the installation of the equipment.

The accuracy of the system is borne out by a test which has taken place with a Lancaster. The aircraft was fitted with synchroscopes which included an arrangement for indicating when any engine became out-of-step by an amount greater than 120 deg; this indication was not made during 20 minutes of flying in bad weather.

The synchronizer has undergone much bench-testing by Rolls-Royce with turbojets, and there is a version of the equipment now available for such an installation.

U.S. TECHNICAL MISCELLANY

DEALING with a variety of aeronautical technical developments, the following are an assortment of news items lately received from the United States :—

Students at Northrop Aeronautical Institute have developed a small turbojet which, called the Centriflow, is of 26in diameter, is 67.4in long, and weighs 172.4 lb. Stated to be capable of driving a "small plane" at 300 m.p.h., the engine runs on 80-octane aviation petrol, and consumes 26 gal/hr. It is planned to install the unit in a Ryan Navion after the completion of ground tests.

At the National Bureau of Standards, tests are now being made with two new electronic altimeters designed to operate at heights above the upper limit of aneroid capacity. One of the new instruments, intended for a height range of between 150,000 and 300,000ft, registers altitude according to the ambient heat transmission across a thermocouple. The other altimeter is wholly electronic in operation, in that electrons from a filament bombard a positively-charged grid, so generating positively-charged ions which are attracted to a negative plate. The ratio of plate current to grid current is proportional to altitude, and the altimeter is designed for operation between 300,000 and 500,000ft.

Patents for a reliable low-cost airport beacon—designed for use at the smaller airfields—and for a high-intensity airport runway marker light, were recently assigned to the Westinghouse Electric Corporation, East Pittsburgh. The low-cost beacon is of rotating type, and has a duplicated light which is automatically illuminated should the main light fail. The new high-intensity runway marker light has a candle-power of up to 100,000, the intensity of the light being controllable for varying weather conditions. The marker light incorporates an optical system, whereby different light signals, as well as different intensities, may be produced.

Another patent (assigned to Northrop Aircraft, Inc.) deals with exhaust-gas disposal from turboprops fitted with pusher propellers. The gases are ejected at the roots of the propeller blades, where they do not interfere with blade efficiency, and a means is provided for cooling the blade roots.

The General Electric Co. have evolved a new process for the economic production of axial compressor stator blades. The process involves the rolling of sectionally contoured strips from which the blades are cut to the desired length. No indication is given of the method of blade attachment to the anchorage base.

AERIAL ART ON SHOW

JUDGING from such sporadic observations as we have been able to make, it is not a common practice for R.A.F. personnel on leave, or otherwise at large in London, to haunt the National Gallery; nor is the Tate overflowing with aesthetically inclined airmen. Their direction into such lofty walks is not our mission in life, but we do counsel everyone associated with military or civil flying, however remotely, to make sure of visiting the Ilford Galley at 106/7 High Holborn, W.C.1 (a few yards from Holborn Underground), where they will find 120 pictures to delight them. These are the work of Charles E. Brown, F.I.B.P., who is one of the three past-master aeronautical photographers in the country (the others, as named by Mr. Brown himself, being John Yoxall and Charles Sims). As Air Chief Marshal Sir Hugh P. Lloyd observed in opening the exhibition, the pictures comprise a text-book of aeronautical progress.

In his welcoming address the Hon. J. P. Philipps, chairman of Ilford, Ltd., remarked that Sir Hugh's interest in aerial photography was not confined to his responsibility for "P.R." flying: he had, it emerged, a very personal association with Charles Brown and his work. As C.O. of the first Wellington squadron, he had occasion, during 1939, to act as "chauffeur" for Charles who—having tried all the windows and hatches of the Wimpey—informed him that nothing would do but that they should return to base for the bodily removal of the tail turret. After hasty consideration of c.g. position, the turret was duly unshipped and sacks of bricks taken aboard in its stead. Then Charles ascended to the poop, where he was lashed (like the skipper's daughter) to the nearest convenient structure. He secured his pictures.

The subject of this anecdote is, as many people in the industry and in the Services will be aware, as modest by nature as in stature; but he had no hesitation in accepting the compliments so liberally paid him by Sir Hugh for, in his own view, he can claim no more than one-third of the credit. This he shares with the pilots of his own, and the subject, aircraft.

At the Ilford exhibition it is an embarrassment to try to single out a particular picture for commendation. John Yoxall was attracted by an echelon of Meteors, and we ourselves decided to ask Charles Brown to name his own favourite. After some meditation he concluded that this was a study of the Valiant; we reproduce it on page 337 of this issue.

FORTHCOMING EVENTS

Mar. 21. Helicopter Association: "Recent Helicopter Research Investigations," by W. Stewart, B.Sc.
Mar. 25. R.Ae.S. Graduates' and Students' Section: Annual General Meeting and Talk on "Aerodynamic Oscillations of Suspension Bridges," by C. Scrutton, B.Sc., A.F.R.Ae.S.
Mar. 26. R.Ae.C.: Annual General Meeting.
Mar. 27. R.Ae.S. Section Lecture: "Civil Jet Aircraft Performance," by D. R. Newman, A.F.R.Ae.S.
Apr. 4. College of Aeronautics: Senior Common Room Society's Annual Dinner.
Apr. 6. London Aeroplane Club: Dawn Patrol and A.G.M.
Apr. 15. R.Ae.C.: Film Show.
Apr. 22. R.Ae.S. Graduates' and Students' Section: "Servomechanisms," by F. H. Barlace, B.Sc.(Eng.), Grad.R.Ae.S.
Apr. 22-24. R.A.F. Golfing Society: Spring Meeting, Walton Heath.
Apr. 24. R.Ae.S.: "Fuel Systems for Turbine-driven Aircraft," by J. E. Walker, A.F.R.Ae.S. (at Luton).
May 3. Vintage Aeroplane Club: Rally, White Waltham.
May 3-10. F.A.I.: Committee Meetings, Madrid.
May 5. I.A.T.A.: Fifth Annual Technical Conference, Copenhagen.
May 5-16. British Industries Fair.
May 10. Exeter Aero Club: Display.

ATOMIC POWER for AIRCRAFT

More from the Leverett Lecture: Shield-weight: Negligible Fuel Consumption

A LECTURE entitled "Aircraft Nuclear Propulsion" was read before the Chicago Branch of the I.Ae.S. last year by Dr. Miles C. Leverett, and was summarised in *Flight* of December 21st, 1951. The full text of the paper has now become available; and, since information on the subject is necessarily restricted, we think this amplification of the earlier report will be of interest.

ONE of the basic principles of nuclear energy, said Dr. Leverett in his lecture, was that the energy of fission was manifested as heat. Thus, an aircraft nuclear propulsion system would consist essentially of a reactor—the heat source—suitably shielded to protect the crew from radiation and of heat machinery to convert the heat into propulsive thrust.

Saying that there was scarcely a single type of aircraft propulsion machinery which had not been proposed for incorporation in a aircraft nuclear power plant, Dr. Leverett mentioned several possible systems, but gave no hint as to which appeared the most promising. He did, however, point out a difficulty met in the installation of nuclear-powered turboprops: such power plants would have to be mounted on the wings of the aircraft and would be fed with hot working fluid from either a central reactor or a separate reactor for each turbine. In the former case, large quantities of hot, and slightly radio-active, fluid would need to be pumped around the aircraft, while the second case—an individual reactor for each turbine—was very unattractive, both from the fuel investment demanded and from the weight viewpoint. The reactor itself might be thought of as a cylindrical body, throughout which fissionable material—such as U-235 or P-239—was distributed. The unit would contain passages for the flow of coolant (working fluid) and would also incorporate a moderator, described later.

To start the reaction, a free neutron from the atmosphere would be captured by a nucleus of, say, U-235. The nucleus would then disintegrate, with the liberation of two or three neutrons and two atomic nuclei both smaller than the original nucleus. These nuclei, or fission fragments, would transmit most of the fission energy to the material into which they were cast, where it would appear as heat. Thus heat energy in a usable form resulted from the fission of the nucleus. The neutrons given off could meet with one of three fates: they might escape from the reactor and be captured by some parasitic nucleus in the shield or surrounding structure; they might be captured by non-fissionable material within the reactor; or they might be captured by a second U-235 nucleus and promote a second fission. If the reactor were so designed as to cause about 40 per cent of the emitted neutrons to cause further fissions, then the reaction would continue indefinitely, until all the fissionable nuclei were used up.

The basic problem of reactor design, said Dr. Leverett, was to reduce to acceptable values the two methods of loss he had mentioned. Neutron leakage might be reduced by surrounding the reactor with a neutron-reflecting material, such as graphite or beryllium oxide, which scattered, but did not capture, the neutrons. The capture of neutrons by non-fissioning nuclei was difficult to reduce, because some of the most suitable materials for the structure of the reactor had a high tendency towards neutron capture. Obviously, said the lecturer, one could increase the fraction of neutrons captured by fissionable nuclei merely by increasing the proportion of U-235 or P-239 in the reactor. Unfortunately, this material was very expensive and it was desirable to keep its investment to the lowest value. The reactor designer, therefore, resorted to use of a moderator—an element of low atomic weight and low tendency towards neutron capture. A neutron striking such a moderator lost a relatively large amount of energy, while probably not being captured. The resulting slowed-up neutron then stood a much higher chance of being captured by the fissionable material than did a rapidly-moving one. Typical moderators that could be used were beryllium and beryllium oxide, water and heavy water, and graphite.

Output from the reactor was, in principle, very simple. A direct control resulted from the insertion of absorbing rods into the reactor to capture a high proportion of neutrons. If, from the critical state (reactor-power steady), the rods were withdrawn so that the fraction of neutrons absorbed was 0.1 per cent greater than before, then the number of neutrons in the reactor would increase by 0.1 per cent in each neutron generation. The reactor temperature and power would thus fairly rapidly build up in an exponential manner; when the desired new output had been reached, re-inserting the rods at their former position would stabilize power at the new level. Other methods of control might be to vary the amount of fissionable material within the reactor, or to use a neutron-reflector of variable area.

It was evident that control of output was important; not only because of the remote "atomic-bomb" possibility, but because the output of the reactor had to be matched by corresponding heat-removal to the aircraft power plants. If this did not obtain, the resulting overheating of the reactor could cause accelerated corrosion, or warping, or even melting; the reactor should never be operated without a flow of coolant, since serious damage or destruction would certainly result.

Although most of the fission energy appeared as heat from the fission products, a substantial proportion was made up of ionizing radiation. The free neutrons and gamma rays, particularly, would prohibit the approach of a human being to within a mile of a high-powered reactor in operation, unless it were properly shielded; moreover, since the fission products themselves were radio-active, one could not approach much nearer than this even after the reactor had been shut down.

The basic shield-requirements were dictated by the two basic types of radiation to be stopped; neutrons were best slowed by light atoms such as hydrogen, while the gamma rays were more readily arrested by heavy elements like lead. For this reason, the best shield, said Dr. Leverett, would contain both light and heavy elements arranged in a suitable pattern. The details of this arrangement had previously been unimportant, since large ground-reactors caused no weight problem; an airborne reactor, however, demanded a careful arrangement of the best materials; the problem was very complicated and had not been fully solved. Another interesting point was that severe radiation leakage might occur through the coolant ducts, which were required to pierce the shield. Generally, neutrons and gamma rays travelled in straight lines; it was, under certain conditions, possible to bend them around corners by reflection. This might prove an interesting solution.

Weight Problems

The lecturer next discussed the weight of the installation, saying that the shield would be the heaviest single item aboard the aircraft. Maximum fuel-loads now met in aircraft were of the order of 75 tons; from early estimates it appeared likely that the weight of a shield and reactor would not be greatly different from this. It was most important to keep the reactor as small as possible in order to reduce the shielded volume; this reduction in size tended to restrict the permissible coolant-flow and increased the pressure-drop; it was also found that, as the reactor diameter decreased, the amount of fissionable material needed increased. The reactor size was, therefore, fairly closely dictated by these conflicting requirements.

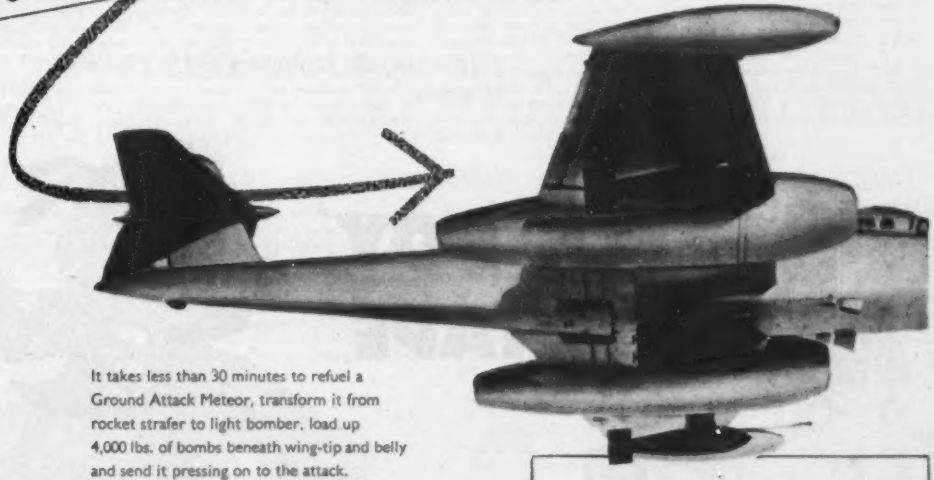
Aircraft structures would have to be specially designed or adapted to take the concentrated weight of the shield and reactor; previously, such weights had been capable of distribution over most of the wings and fuselage. In particular, the wings of the atomic-powered aircraft would be likely to experience greatly increased bending-moments.

A further characteristic was that, due to the small fuel consumption, landing weight would be essentially the same as maximum take-off weight, giving rise to a series of new problems. This would not only demand a very strong landing gear, but might result in very high landing-speeds, necessitating changes in the designed landing-attitude.

The high power-output and small size demanded of the reactor pushed the heat-transfer designer to the limit of his knowledge. He had to avoid hot-spots in his flow system, while maintaining good flow distribution; he also needed to know the exact power-distribution within the reactor in order to supply the correct coolant-flow to each part. As an instance of the problems involved the lecturer considered the cooling of a surface beneath which nuclear fuel was located in the reactor; the rate of heat generation was independent of local temperature, so that an insufficient flow of coolant would cause a rise in temperature until the surface melted or disintegrated. The reactor could be likened to a heat-exchanger to which heat was constantly supplied, whether it was taken away again or not; a possible solution had been suggested by the use of a reactor in which the fuel was in solution with the coolant.

On the question of fuel requirements, Dr. Leverett said that there was a fixed critical mass below which a chain reaction could not be sustained: moreoever, the products of fission remained in

Quick-change artist



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ATOMIC POWER for AIRCRAFT . . .

the fuel elements as "impurities." After the fissionable matter had decreased to below the critical value, the remaining fuel would need to be removed, purified, and prepared for re-use. Thus, the total fuel investment per aircraft would not only involve a "reactor-full" on board, but also an amount on the ground in various stages of recovery.

Internuclear collisions resulted in the dislocation of the nuclei involved. While the full results of this type of reaction were unknown, it was realized that changes—usually of a detrimental nature—could take place to the properties of the materials. A decrease in thermal conductivity might occur, making heat-removal progressively more difficult. Some liquids or gases proposed as reactor coolants were decomposed by radiation and rendered useless. Organic materials appeared particularly susceptible and, even outside zones of intense radiation, most lubricants turned tarry, or even solidified; lubricated machinery could not, therefore, be used in such locations. A further source of trouble was the fact that electrical insulation broke down or disintegrated upon prolonged exposure to such radiation. This whole subject said Dr. Leverett, was known as *radiation damage*, and a great field of investigation was being explored in finding suitable materials for such installations.

The actual materials used in the power plant would need to resist high temperature, corrosion by various coolants, thermal and mechanical stresses, and radiation damage, which could combine to form an extremely severe demand. By painting the reactor heat-transfer surfaces with a thin corrosion-resistant coating, the critical mass might be doubled. A brazing alloy containing a few per cent of boron (a strong neutron-absorber) might render a critical mass impossible of attainment, while the same characteristic might necessitate the use of materials with poorer mechanical and corrosion properties than other alloys in which neutron-absorbers—like nickel—were present in higher percentages.

In many respects, the propulsion of aircraft was an ideal application for nuclear energy; for example, a highly-concentrated heat source could be used to advantage. It was only such a high-performance, premium use of energy which could justify the consumption of such a rare resource as U-235 or P-239. The lecturer felt that efforts to fly a nuclear-powered aircraft would be successful. In his opinion, the difficulty of the task and the value of the result formed a challenge unmatched elsewhere.

RESERVIST WITHOUT REGRET

SOME six months ago—to be precise, in *Flight* of August 10th, 1951—we published a brief article recording the impressions of an ex-war flying instructor on first finding himself recalled from the Volunteer Reserve for 18 months' regular service with the R.A.F.

It may be recalled that the impressions were not altogether uncritical; but now, those who were the first to be recalled have completed over half their time and—in the words of our friend—"many of their initial difficulties have ceased to trouble them."

Most of the Reservists, he says, have been absorbed into Flying Training Command, and on some stations their influence is being felt in more ways than one. Some are to be found in station sports teams, and some in the many other activities which contribute to the well-being of a unit. In particular, many Reservists were selected to fly aircraft in displays held in various parts of the United Kingdom on Battle of Britain day.

Whilst the majority of Reservists are employed on Prentices and Harvards, there are a few who are doing excellent work on Operational Flying Units, where they are able to pass on their valuable war-time experiences to the young crews now being trained.

All this goes on (continued our informant), but we are reminded of the daily hazards which these Reservists face side by side with the Regular Air Force when we hear of narrow escapes such as that of F/O. Bennett (Cardiff Reservist), who was forced to abandon his aircraft at a very low altitude at night. His friends will be glad to hear that he was last reported enjoying a well-deserved pint among his fellow Reservists at his parent unit, though a plaster jacket is keeping him inactive for the time being.

And so, at the end of nine months' service with the Regular boys, the 18-month V.R.s have said good-bye to their three-month colleagues recalled during last summer for jet conversion, and have wished them good luck with the £50 tax-free gratuity which they received upon completion of their service. The 18-monthers are now bent on the job for which they were recalled—namely, to teach the young Servicemen of today the art of flying.

They look with added hope towards the new Secretary of State for Air, in the belief that it will please him to regard their efforts kindly, and so announce a gratuity payable to them on completion of their tour of duty, in like manner to the one already granted to the three-month V.R.s. These instructors, separated from their homes and families for 18 months, after some five years of resettled civilian life, have given up their jobs, their chances of promotion, and the many opportunities which present themselves from day to day in civilian life, to give further service to their country. Is it not, therefore, reasonable that they should receive a gratuity with which they might fortify themselves to face the rigours of civvy street, when they return to their schools to teach, their benches to work, their shops and businesses, their banks and offices—their job well done, and their uniforms once more back on the coat hanger in the spare bedroom?

HAIR IN HIS CHEST: THE INTERNAL ECONOMY OF A SYNTHETIC PARACHUTIST

WITH due respect to the Hairlok Co., Ltd., whose creation he is (to the design of the G.Q. Parachute Co., Ltd.), we cannot help associating this overalled type with certain characters who are wont to stray into our more phantasmagorical nightmares. As described in *Flight* of February 29th (p. 243), he, or it, is intended to undertake a number of dangerous rôles, notably the testing of parachutes and ejector seats: an example has lately been tested at Woomera. The dummy reproduces the physique of the average aircrew member, to which end the internal mechanisms of 1,200 human bodies were analyzed from data provided by the Air Ministry Medical Department and the University of London. In the group, reading from left to right, are Mr. H. A. Howard (Hairlok); Dr. R. E. Gibb (London University); S/L. R. Albrecht (G.Q.); and Mr. Raymond Quilter, G.Q. chairman.

"Flight" photographs

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Bread-and-Butter Airliners

HAVING spent a considerable portion of the last five years studying aviation in many parts of the globe, I must place on record how much I agree with Charles Gardner in his recent article where he suggests that, good as our present manufacturing lead is now, we are in grave danger of missing the boat—and probably the last boat at that.

But, however big a jolt W/C. Gardner has given to our too-complacent majority, I suggest that he has told only half the story, and I hope that the other half, which I propose to add, will give an even bigger kick to the wishful thinkers.

There are many airlines that do not require high-speed, long-range, large-payload aircraft. This is particularly true of Colonial routes, where the DC-3 and the Lodestar are filling the bill and can operate profitably. These aircraft will soon have to be replaced *and the U.K. is not building a replacement.*

The Heron carries a passenger load comparable with that of the Lodestar, but its freight capacity does not compare favourably. The Marathon may prove to be a good aeroplane but it lies midway between Lodestar and DC-3. The Viking is the nearest approach to what is needed but, quite apart from availability, many operators tell me it will not replace the DC-3 where small airfields have to be used.

I don't know how many aircraft of the types mentioned are in service across the world today but I will hazard a guess that the DC-3 still holds first place among the 2,250 civil airline aircraft in use by I.A.T.A. members at the end of 1951. These will all go out of service within a fairly short time of each other and the market is wide open.

Even the old Rapide cannot be replaced by a British aeroplane; and East African Airways, having no dollars to spare, have been forced to buy Macchi B.320s as replacements. A British Airline compelled to buy Italian Aircraft! I wonder how that strikes our Comet-inspired wishful thinkers?

London, S.E.22. BASIL CLARKE.

Did the Brabazon Committee Fail?

ON page 278 of the March 7th issue of *Flight* you quote Mr. Peter Masefield's remarks on lessons to be learned from the work of the Brabazon Committee. He is also quoted as saying that the committee performed a national service of the first importance.

No one will deny the unenviable nature of the task of trying to predict future requirements in the ever-changing world of air transport or the courage of any committee undertaking such a commitment: but surely the importance of such service to the nation should be judged by the measure of its success and, to judge by the particulars given by Mr. Masefield, the recommendations of the Brabazon Committee were sadly wide of the mark.

The Brabazon I was envisaged as a 25-seater. It is hard to see how this was expected to be a paying proposition: while one might also question the wisdom of designing an aircraft with a cruising speed of only about 250 m.p.h. for a long-range-over-water route on which head-winds of 60 m.p.h. and more are encountered. Be that as it may, the fact remains that after nine years and the expenditure of millions of pounds, the prototype has not yet completed its flight trials; and when it does, there appears little likelihood of its ever being used for the purpose for which it was proposed.

The Brabazon II was specified by the Brabazon Committee to carry 24 passengers where, in fact, a machine of two to three times that capacity was required. Similarly, the Brabazon IIB was to carry 27 passengers, and has fortunately been capable of re-design to accommodate 40.

The Brabazon III never materialized.

The Brabazon IV was envisaged as a mailplane, whereas its success is due to the fact that it developed into something quite different—a very much larger aircraft to carry passengers.

The Brabazon Va specification was written around a private-venture design put forward by Miles: and even that is not yet in service although pressure is being put upon an unwilling B.E.A.C. to use it.

The Brabazon Vb specification was, I believe, written to cover another P.V. design, the Dove, the success of which is due to the de Havilland Company.

So, out of the seven specifications with which the Brabazon Committee are credited, only one, the Brabazon III, appears to have been what was wanted: and that, ironically enough, was not ordered. With the exception of the P.V. Dove, not one of the other types is yet in use. While making full allowance for the difficulties confronting the committee, how, in view of the results, can its work be regarded as other than a failure? Surely the first lesson to be learned from all this is not to put your trust in committees: or, as I heard it said the other day, "If Moses had been a committee, the Israelites would still be in Egypt!"

Farnborough, Hants. D. L. BROWN.

Manpower: Two Suggestions

YOU have recently given considerable space to articles and correspondence on the manpower shortage in the aircraft industry lately. May I propose a couple of ideas?

I am an ex-flying instructor (war-time E.F.T.S.), now comfortably settled back into my job as a telephone maintenance engineer in charge of four small automatic telephone exchanges. I have to be on call for emergency attendance, so much of my time at evenings and week-ends is spent at home.

Since many hundreds of my colleagues are in the same boat, could we not be provided with materials, diagrams, etc., for the manufacture of sub-assemblies of many of the electro-mechanical devices used in aircraft construction today? This work would be done at home in our spare time.

My second idea concerns the "seconding" of personnel from telephone to aircraft work. With the Government committed to reduction of capital expenditure on new telephone plant it should be possible to "second" staff to the aircraft industry for periods of, say, three to five years. This could be done along existing lines, as when one of the big oil companies, or Colonial Governments, ask for personnel from Post Office Telephones.

I feel sure that many telephone engineers, and especially those around the 40 mark, would like the chance to transfer to the vital job of helping the aircraft industry, knowing that at the end of their secondment full re-instatement to their old job would be waiting. By that time, too, we'll hope that expansion of the telephone system will be possible.

Official P.O. opinion, of course, may be against any such suggestion, but in the circumstances I think the idea is worthy of consideration.

East Anglia. TELECOM.

Auster Stamp

I WAS very interested to see, in your issue of February 22nd, the item of news with the illustration of the new Falklands Island stamp bearing an Auster aircraft.

A spot of research shows that this stamp—one of a series of 14 values—was designed from a drawing by an Auster pilot, Mr. Victor Spencer, who was also responsible for other fine drawings of the set.

Another interesting point is that the index letters of the aircraft appear to be VP-FAB—as seen beneath the magnifying glass, of course!

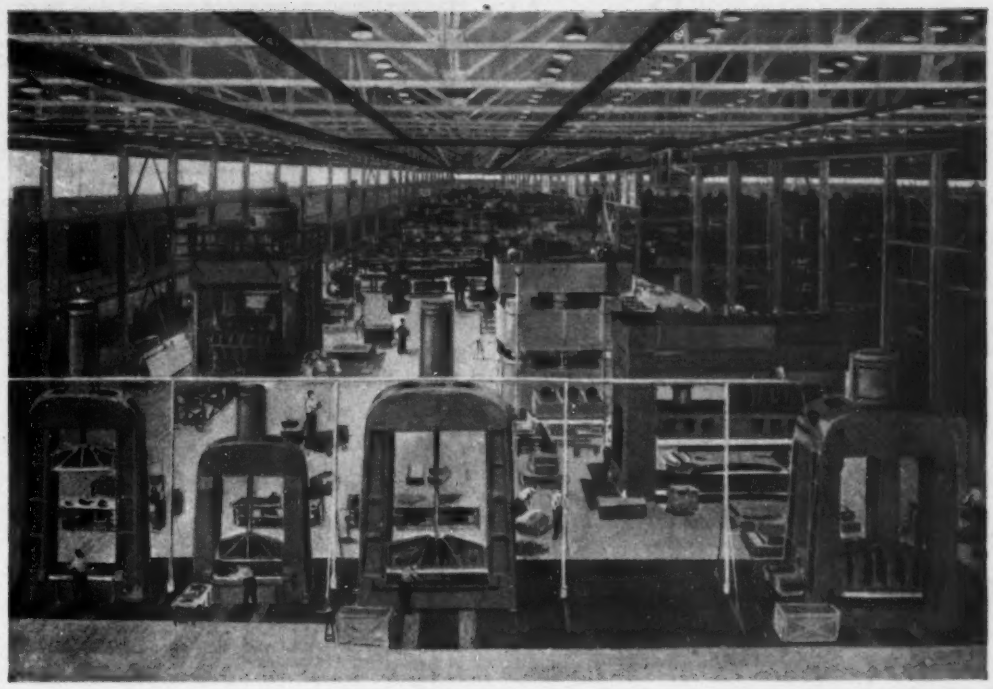
Hitchin, Herts. ERIC B. WILLIAMS.

Here they Come Again

THE crews of B-29 flying over Korea at night have been reporting globular objects (dangerous, too—one followed a B-29 for more than a minute!) and just to revive the old flying saucers further a recent issue of *Time* reports that some members of the Southern Californian aircraft manufacturers have formed an organization called the Civilian Saucer Investigation "to give proper scientific analysis to the swarming rumours." The organization is asking all "sighters" to report everything odd they see in the sky. Dr. Walter Riedel, late of Peenemünde and now of North American Aviation, Inc., is also said to be convinced that there are strange craft in the sky and that they come from outer space.

It is perhaps interesting to record that the late C. F. Snowden Gamble, in his book *The Air Weapon*, published in 1931, wrote: "At the beginning of the war the Boers were led to believe that we intended to bomb Pretoria from the air. The post offices were, therefore, given instructions to report by telegram the appearance of balloons—with the result that, for the next few weeks, the Boer authorities were inundated with telegrams from 'back-veldt' Boers who claimed to have seen balloons making for Pretoria. Most of them were equipped, so the telegrams stated, with coloured searchlights."

London, W.14 JOHN STROUD.



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Vignettes of CANADA — AIR LAND

An example of the alertness of Canada's air-mindedness in this recent flight against time. . . . On January 14th, 1952, a piece of radio-active metal the size of a thumbnail was taken out of the Chalk River atomic reactor in the Province of Ontario and whipped away by a Trans Canada Airlines plane to the University of Michigan laboratories in the United States.

Since the radioactivity in the radio-isotope of palladium dies very quickly, . . . speed was essential.

This incident is typical of the way Canadians turn to the use of aircraft for unusual and difficult undertakings.

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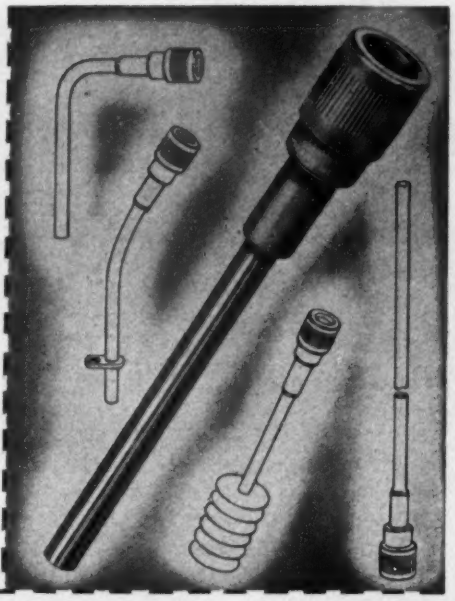

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TELEGRAMS: "AIRCRAFT"

Commercial Aviation Commentary

By HENRY MORRIS

IN the second article of this series, your correspondent referred to the growing realization that the health and capacity of the aircraft manufacturing industry, the strength of the strategic air-transport reserve, and the international status of British mercantile air transport are all inextricably interwoven.

Since then there has been a crescendo of articles and correspondence emphasizing the seriousness of the position, and the need for immediate and drastic action by the Government to get the transport aircraft flying. The basic theme has been that this is not a secondary problem to be shelved until better times, but a major one to be tackled *now* as part of the drive to hasten those better times.

The urgency of finding a solution to the problem is emphasized in the recent crop of articles and letters by distinguished leaders in the aviation world—Lord Douglas in *The Observer*, Mr. Peter Masefield in *Shell Aviation News*, and Sir Guy Garrod in *The Times*, to quote a few.

There is little or no dispute over the seriousness of the situation—which cannot be over-stated—but the reasons for it are, I think, usually passed over too airily. The most common line is to trace it back directly to the war-time policy under which virtually all transport-aircraft production was concentrated in the U.S.A. whilst the United Kingdom devoted its factories to fighters and bombers. This certainly explains the situation of the United Kingdom in the immediate post-war years. But it does *not* justify the state of affairs in 1952, when a country that for several years has had a very healthy lead in the design and construction of turbojets and turboprops (and has publicized the fact far and wide) finds itself physically incapable of producing those aircraft in sufficient numbers to meet its own requirements, let alone export them.

It is not enough to bemoan the fact that there are insufficient skilled workers to build the aircraft, or that inadequate factory capacity is allocated to transport types. It is essential to endeavour to ferret out why, if we have this great lead in the design of these types (and they are in fact as good commercially as we say they are), we are not already exporting them in large numbers.

Lord Douglas hits the nail squarely on the head when he says that "we now have the means . . . to become the chief supplier of foreign air lines, rather as we have been the world's chief merchant carriers at sea and the world's leading shipbuilders."

There is the answer in a nutshell. We became the leading ship-exporters because we *first* became the leading merchant sea-carriers. Foreign countries saw our merchant marine expanding profitably into all the most remote corners of the globe, and realized, albeit reluctantly, that they simply had to "buy British bottoms." And because we had such a large, and expanding, merchant marine our shipyards were so efficient and numerous that they were able to absorb all, or most of, the foreign demand for British-built ships. If we really wanted and intended to become the leading transport aircraft exporters we had to achieve a precisely similar position for our Mercantile Air Service.

* * *

THAT such an achievement has not materialized is due almost entirely to the restrictive and atrophied policy of the Government. Only a few months ago such a statement would have roused a howl of disagreement; now it can be made with only a small risk of a murmur of disapproval, emanating mainly from sources embarrassed with slightly (or in some cases considerably more than slightly) guilty consciences.

The United Kingdom air transport policy since the war has, unfortunately, been too closely linked up with political dogma and too saddled with obsolescent theories. In 1944, because of the weak position the United Kingdom air transport industry would inevitably find itself in at the end of the war, it was decided that the only possible course was to encourage a policy of maximum control and restriction of international air transport. The idea was that other more fortunate countries would be held in check until the United Kingdom industry recovered itself and could catch up with its foreign competitors. A comfortable policy—provided all other countries remained content to be held in check, and provided that no dogmatic theories were allowed to interfere with the task of building up a really strong and adequate British Mercantile Aviation.

In the event this policy has proved a dismal failure. Our air-transport industry is completely incapable of coping with the potential traffic now waiting to be tapped, the weakness of our strategic air-transport reserve is causing considerable concern, and we have to watch the embarrassing efforts of our air-transport representatives at international conferences to stave off the introduction of new types of services which would open up vast new markets, purely because the British aircraft do not exist to cope with these markets!

To carry this survey of the "whys and wherefores" a stage further one would really need to know exactly at what point the British Government and the Air Corporations did accept the principle that "air-coach" or "tourist services," call them what you will, were the key to a vast expansion in the passenger-carrying trade; and at what point realization dawned that air freighting was a specialized branch of the industry, capable of indefinite expansion with modern aircraft types, and was not to be regarded purely as convenient "fill-up" load for empty corners on scheduled passenger services. One has more than a suspicion that both the Government and the Corporations gravely miscalculated the traffic potential and the types of aircraft and size of fleets needed to cope with it.

* * *

A GLANCE at even a few comparative figures is staggering. The actual load ton-miles achieved by the U.S. industry in 1951 was approximately 1,900,000,000. The combined L.T.M. achieved of the British Corporations in 1951 was probably in the region of 220,000,000. In 1951, approximately 389,000,000 L.T.M.s of freight were handled by U.S.A. carriers. In the year ending March, 1951, the figure for the British Corporations was 33,000,000.

The C.A.A. estimates that by 1955 the U.S.A. air freight trade will amount to 1,115,000 tons per annum or approximately 1,200,000,000 L.T.M.s—the limitation being available aircraft and not available business! By 1954 there may be about 300 registered civil transport aircraft on the United Kingdom register. The U.S.A. will have approximately 2,200 civil transport aircraft, a large proportion of which will be four-engined types including a goodly number of DC-6s, DC-7s and Super Constellations.

Admittedly, domestic operations in the U.S.A. will absorb a large slice of this capacity, but America expects that its international capacity will nevertheless be several times that of the United Kingdom. If, three to four years ago, our manufacturers had been working on orders for a hundred or so large aircraft destined for British air-transport concerns, the factories might now have been better manned and equipped to play their part in ameliorating our present plight. And types which had already been proven by British operators would have found a clamorous export market. Our only hope is that the Government will now, before it is too late, give this problem the priority it demands, and that on the air-transport side they will encourage both the State Air Corporations and the independent operators to "get to it" so that under the stimulus of friendly competition (and co-operation) a merchant air service will develop which will make our old merchant sea-captains stir comfortably in their graves at the pleasant thought that the traditions they started are being maintained in this new element. As Lord Douglas so rightly says, it literally is "now or never."

CIVIL AVIATION

SIX SWISS SIXES: HB-IBA, first of the two Swissair DC-6Bs now in service on the company's North Atlantic routes. Swissair is due to receive a third DC-6B next month and a further three next year.

THE BUDGET

IN his Budget speech in the House of Commons on March 11th, Mr. R. A. Butler, the Chancellor of the Exchequer, announced an increase in tax of 7½d an Imperial gallon on petrol and oil. This will constitute yet another unfortunate blow to B.O.A.C. and B.E.A. All fuel consumed by the Corporations' aircraft within the United Kingdom is subject to tax and the fuel used by their ground transport is, of course, also liable. B.O.A.C. has announced that the increase in tax will cost about another £84,500 a year, while B.E.A. estimates its burden at about £100,000.

Air-mail letter rates, also, are to be raised: letters now costing 6d per half-ounce will rise to 9d, while 3d will be added to those now costing 1s and 1s 6d. There will be no increase in the normal European letter rate of 4d for the first ounce, at which most first-class mail is flown without surcharge. B.O.A.C. is, therefore, most likely to feel the effect of any reduction in the volume of air mail.

TWO-CAPITAL AIR EXPRESS

A NEW direct air service linking Dublin and Edinburgh will be opened on April 21st by Aer Lingus. Initially it will be flown three times a week in each direction, but the frequency will be stepped up to once daily during the holiday season. Single fare will be £5 10s and one-year return £9 18s. A 17-day spring excursion fare of £8 5s will be effective up to June 9th.

The support given to the Aer Lingus Dublin-Glasgow service and the interest shown by the Scottish Air Advisory Council have both influenced the decision to open this new route.

B.E.A. HELICOPTER SERVICE ENDS

THE present phase of helicopter experiments now being carried out by B.E.A. will end when the London-Northolt-Birmingham passenger service is withdrawn after April 5th.

B.E.A. officially opened this service, operated with Sikorsky S-51 three-passenger helicopters, on June 1st, 1951, and public services began on June 4th. Much has been learned from both the operating and traffic aspects and B.E.A. is now hoping to replace the passenger operation with a freight service, perhaps using the Bristol 171 four-passenger delivered to the Corporation's Helicopter Unit. Freight services would allow B.E.A. to fly its helicopters at night and under instrument conditions; this is forbidden at present on helicopter passenger flights.

It is unfortunate that Britain will no longer operate a passenger service with helicopters, but all such services must be regarded as experimental until the introduction of larger, more economic multi-engined types. The only other scheduled helicopter services at present in operation are those now carrying mail in Belgium and those introduced earlier in the Los Angeles and Chicago areas.

ASSOCIATE AGREEMENTS AND THE C.I.

SO far only six new B.E.A. Associate Agreements have been approved for this year, of which four concern services to Guernsey and Jersey. The £25 overseas travel allowance will almost certainly cause record traffic between the British Isles and the Channel Islands during the coming summer. The B.E.A. advance timetable for the summer Channel Islands services, printed in green, is reminiscent of a pre-war Southern Railway timetable; it shows that the Corporation will be operating as many as 21 Northolt-Jersey services in each direction on Saturdays from July 1st to September 13th and that for part of this time there will be ten Saturday services to Guernsey. There will be services to the Channel Islands from Birmingham, Glasgow, Manchester and Southampton; inter-island services will also be maintained at high frequency.

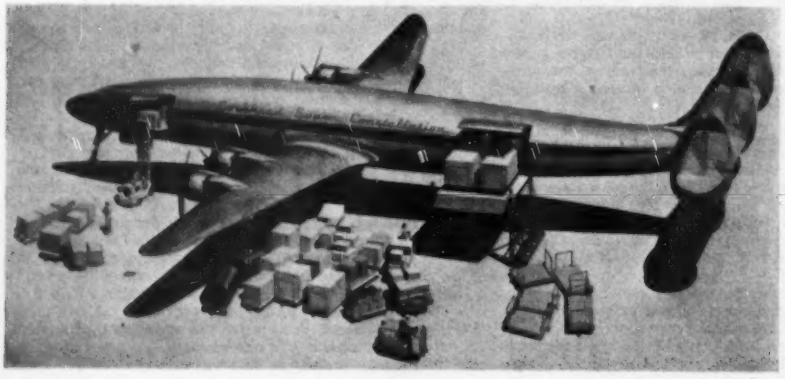
Details of the Associate Agreements now approved are: Airlines (Jersey), Ltd.—Gatwick-Guernsey-Jersey (Saturdays only), Plymouth-Exeter-Guernsey-Jersey (daily); Cambrian Air Services, Ltd.—Cardiff-Weston-super-Mare (daily to March, 1953); Manx Air Charter, Ltd.—Isle of Man-Carlisle (Fridays, Saturdays and Sundays); Morton Air Services, Ltd.—Croydon-Guernsey-Jersey (Saturdays only); and Olley Air Service, Ltd.—Croydon-Guernsey-Jersey (Saturdays only).

MANCHESTER EXPANDS

SCHEDULED aircraft movements at Ringway, Manchester, will reach a new high level during the summer with a weekly total of 84 landings and take-offs.

K.L.M. will be operating six Convair-Liner services a week on its Amsterdam-Manchester route, of which three will continue to Dublin; Air France will fly six weekly DC-3 services to Paris and one DC-3 and one DC-4 to Dinard; Sabena will fly four DC-3 services a week to Brussels, calling at Le Zoute from June 16th; and Swissair will fly seven services a week to Zürich—two of these will be night services and all will be operated with DC-3s.

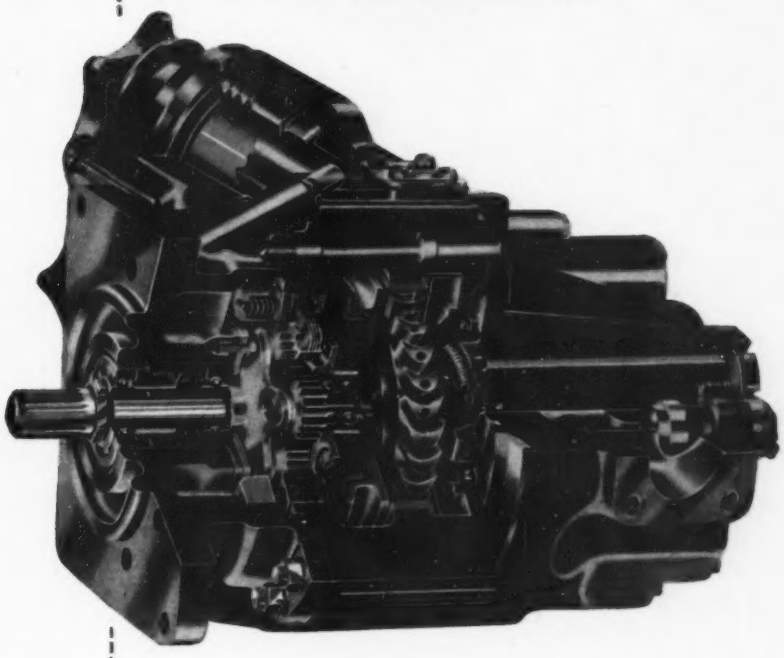
The other 34 movements will be those of B.E.A. and Aer Lingus. The B.E.A. services will include those on the new routes from Manchester to Amsterdam, Düsseldorf, Glasgow and Zürich.



PRESSURIZED CARGO: A preview drawing of the cargo version of the Super Constellation. The first of these aircraft will go into transatlantic operation with Seaboard and Western Airlines. Fore and aft doors will permit simultaneous loading of the 84ft-long pressurized cabin

A TURBO-STARTER

FOR GAS TURBINE ENGINES



PERFORMANCE • SERVICEABILITY

* Rapid acceleration to self-sustaining speed independent of any ground source.
* Altitude and environment proofed cordite cartridge.
* Self-contained multi-breech with no rotating parts.
* Should engine fail to start, another attempt may be made after 15 seconds.
* Overload clutch allows re-engagement into engine running at low speed.
* Overspeed device controls speed if re-engaged into engine running at high speed.
* Excess pressure relief valve.
* Electrically fired cartridges cannot be ignited until breeches are locked.
* Gear box oil lubricated from engine system.
* Five hundred operations between overhaul.

COMPLETE STARTING SYSTEMS FOR GAS TURBINE ENGINES

ROTAX

ROTAX LIMITED • WILLESDEN JUNCTION • LONDON • N.W.10 • ENGLAND
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SMITHS INDUCTOR PRESSURE GAUGE

(Actual size)

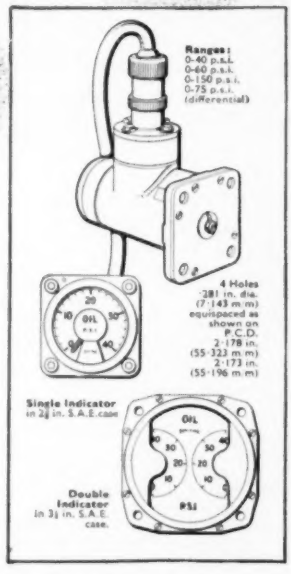
SIMPLIFIED MEASUREMENT OF OIL AND FUEL PRESSURES

Developed in conjunction with the British Engine Manufacturers, the Transmitter of this new electrical pressure measuring system is designed for direct flange mounting on the engine and is entirely unaffected by vibration, as there are no moving contacts.

Indicators may be of the single long scale type or twin scale, and calibrated 0-40, 0-60, or 0-150 p.s.i. for the oil pressure range and 0-75 p.s.i. for fuel pressures.

The equipment requires a power supply of 26 volts 400 cycles and a miniature transformer is available so that the system may be used on the standard 115 volt aircraft supply. The power input to the Transformer is 10 VA at ·5 Power Factor when the circuit contains a single Inductor Pressure Indicator.

Approved by the Air Registration Board and adopted by many British Constructors for Military and Civil Aircraft.



SMITHS AIRCRAFT INSTRUMENTS LIMITED

The Aviation Division of S. Smith & Sons (England) Ltd.

Cricklewood Works, London, NW2

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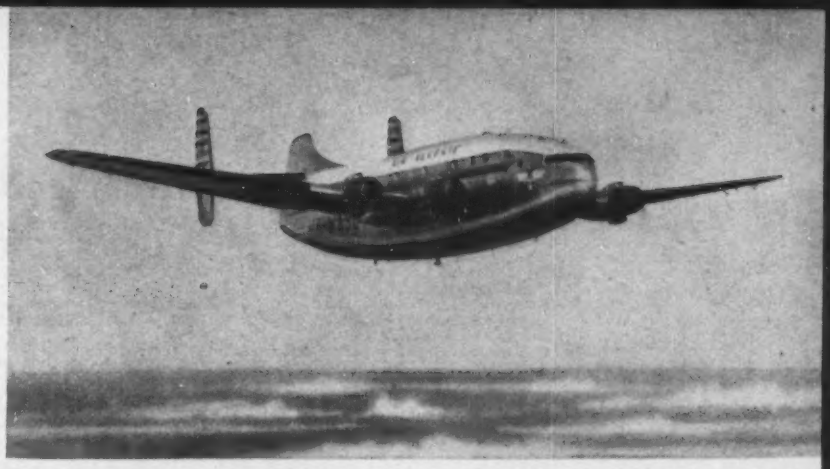

SEATS ON TOP: This 45-ton double-deck Breguet 761, seen here with the blue and red markings of Air Algerie, is to be operated on that company's Toulouse-Algiers route.

CIVIL AVIATION . . .

THREE-ENGINED DC-3

THE DC-3 equipped with an auxiliary Turboméca turbo-jet, first exhibited at Le Bourget in connection with the 1951 Paris Aeronautical Salon, has recently completed a series of official tests under the control of the flight-test centre of the French Air Ministry.

The increased rate of climb of the aircraft with one of the piston engines inoperative was measured in various configurations during the total of 50 test flights. The tests showed that in standard conditions the increase in the rate of climb during the critical take-off period is about 70 ft/min which under equal safety conditions is equal to an increase of 1,770 lb in the all-up weight of the aircraft.

The Turboméca has been certificated in compliance with I.C.A.O. standards at a thrust of 350 lb, but in the DC-3 tests a unit giving only 310 lb static thrust was used.

NO B.E.A./B.O.A.C. MERGER

FOR some time there have been persistent rumours that B.E.A. and B.O.A.C. may be merged to form a single British Airways Corporation. This story, which had caused some trepidation among the staffs of the two Corporations—particularly those in the younger of the two organizations—was officially denied last week in the House of Commons. In answer to a question from Mr. Beswick, the Minister of Transport and Civil Aviation said, "No change in the separate existence of the two Corporations is under consideration."

THE CORPORATIONS IN NOVEMBER

THE November, 1951, traffic returns for B.O.A.C. and B.E.A., together with their United Kingdom associates, show a 28 per cent rise in passenger-miles flown—73,643,000 in November, 1951, as against 57,334,000 in November, 1950. B.O.A.C. revenue traffic exceeded 9,000,000 short ton-miles, a rise of 21 per cent, with an overall load-factor of 64 per cent compared with 57 per cent for the same period in 1950.

B.E.A. traffic rose by 29 per cent to over 2,000,000 short ton-miles with a load-factor of 63 per cent, compared with 53 per cent in November, 1950.

CUSTOMS FOR STAVERTON?

IT is expected that Staverton Airport, owned jointly by Gloucester and Cheltenham Corporations, will have Customs facilities. The airport was used last year by Murray Chown Aviation when they operated a Cheltenham-Jersey run in association with B.E.A., but the service was suspended during the winter.

It is reported that Aer Lingus is considering making an intermediate stop at Staverton on its Dublin-London route if and when Customs facilities are provided. Staverton was a request call of Railway Air Services before the war.

BREVITIES

During February, B.E.A. carried approximately 51,200 passengers, an increase of just over 17 per cent compared with the corresponding period last year, and 37½ per cent better than in February, 1950. International routes showed the greater passenger increase, rising by 21½ per cent from 27,700 in February, 1951, to 33,600 in February of this year. On the domestic services the February figures were 15,900 and 17,600 for 1951 and 1952 respectively, an increase of 10½ per cent.

* * *

Although Japan Air Lines is the only national airline at present operating in Japan, it is reported that the Japanese Aeronautics Board has received 14 applications for internal airline operations when the peace treaty becomes effective.

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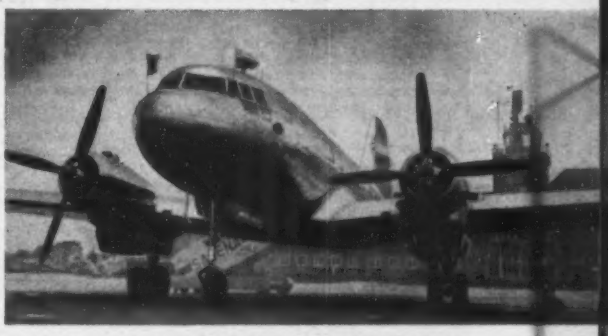
It is announced by Mitchell Cotts and Co., Ltd., that as from March 31st they have agreed to relinquish the sole agency which



A LITTLE OF A LOT: One of the IL 12 aircraft used by Polskie Linie Lotnicze (Polish Air Lines) on its twice-weekly Warsaw-Berlin-Brussels-Paris service, seen here at Melsbroek Airport, Brussels.

was held for Hunting Air Transport, Ltd., on the Baltic Exchange. This change has been necessitated by the reorganization within the Hunting Group of companies, and it is understood that as a result of this the agency will be carried on by E. A. Gibson and Co., Ltd., with effect from April 1st.

* * *

Trans World Airlines has leased two of its 55 DC-3s to North-east Airlines and two more to Wisconsin Central Airlines. No sales are planned, however, until deliveries of Super Constellation and Martin 4-0-4s are well under way. Eastern Air Lines, also, have recently sold 20 of their fleet of 49 DC-3s, but no further sales are planned by this company in the near future.

* * *

American Airlines flew nearly 90,000,000 ton-miles of cargo during 1951, a figure which they claim is a record. The cargo volume was up 40 per cent on 1950's figure. Some 72.4 per cent of the total volume of cargo was carried on A.A.'s 144 mixed passenger-freight aircraft, the rest on its 13 DC-4 "airfreighters."

* * *

Better aerodromes, better services, and, finally, new aircraft on the internal air services of New Zealand from Whangarei to Invercargill are being planned by the National Airways Corporation. In a message to the Corporation's staff the general manager said the probable main developments included a new replacement aircraft, probably a turbojet, by 1956; improvements to a number of airports, including lighting of New Plymouth, Gisborne, Napier and Palmerston North aerodromes for night use; daily main trunk freight services; new routes; Sunday services and permanent summer and winter timetables. He added that these developments were subject to official approval.

* * *

Carrs Auto Sales, Ltd., state that when the M.C.A. gave them the contract to operate the car-hire service at London and Northolt Airports a motor-cycle dispatch-rider service was also included. Details of both services, including charges, are given in leaflets issued from the firm's address at Standard House, South End, Croydon (Croydon 6088).

CIVIL AVIATION . . .

CLUB AND GLIDING NEWS

ON Sunday, April 20th, the Redhill Flying Club is to hold its first dawn patrol of the season. Most private pilots and flying club members will remember last year's successful dawn patrol organized by the club; it attracted the largest number of light aircraft for an event of this kind since before the war.

Taking the same form as those of last year, the rules require attackers to fly in at an altitude of between 1,000ft and 3,000ft and to arrive between 0900 and 0930 hr. Pilots are asked to avoid, as far as possible, approaching over the town of Redhill and are also reminded that, as Redhill is in the outer London Control Zone, provision must be made to conform with regulations should I.F.R. apply. Those landing without having their registration letters taken will, of course, qualify for a free breakfast. (Doubtless the defenders will be keeping a particularly keen look-out for a Dragon which last year crept over the hedge at 0900 hr, undetected, with seven up.)

The Redhill Flying Club, incidentally, have so far this year recorded no fewer than 150 hours of flying and have a total flying membership of over 200. Several pupils have been awarded their P.P.L.s since the beginning of the year and many more are now under training. Solo flying is available on the club's fleet of Magisters and Autocrats at £2 10s per hour on Wednesdays, Thursdays and Fridays, and at £3 per hour during week-ends. Dual rates are standardized at £3 10s per hour.

THE Herts and Essex Aero Club has so far this year logged a total of over 340 hours on its fleet of two Tiger Moths, three Autocrats and one Piper Cub. In addition to these machines, the club also operates a Proctor and a Rapide, while numerous privately-owned aircraft are to be found in the hangars at Broxbourne. Despite the adverse weather, five pupils have succeeded in making their first solos this year, and two have so far been awarded their Private Pilots' Licences. Active flying membership is now over 100, with almost twice that number of associate members.

The club has recently welcomed a new assistant flying instructor, Mr. E. J. McMahon, who, with Mr. P. Ayles, will carry out full-time instruction; at week-ends the instructional team is further augmented.

Next Sunday, March 23rd, the club is to hold another of its popular dances in the club-house.

DURING February the Strathtay Aero Club logged a total of 93 hr 15 min. Four members of the S.A.C. completed requirements for their Private Pilots' Licences during that month and three first solos were also carried out. The monthly club evenings are being well attended and, with the lengthening days, it is hoped to organize various "flying visits" to neighbouring aero clubs with a view to getting some of their associate members airborne—a sociable gesture which might well be copied.

WITH HIS NEW AUSTER V: Capt. Bethouart, who recently flew it back to his home in French Morocco via Paris, Marseilles, Barcelona, Tangiers and Casablanca. Capt. Bethouart will use his machine for travelling to various cities from his home airfield, which, incidentally, is 7,800ft above sea level. The journey by road to the nearest town normally takes ten hours; it will now take him 75 minutes.

ANOTHER date in the forthcoming season's racing calendar will be May 3rd, when the West London Trophy Air Race is to be flown from White Waltham during the Vintage Aeroplane Club's rally. Open to V.A.C. members only—in suitably aged aircraft—the course will cover three laps of a closed circuit of approximately nine miles. Information may be obtained from the Hon. Secretary, 9, Imperial Road, Windsor, Berks.

IN order to assist private-aircraft owners intending to fly to the Olympic Games (July 19th-August 3rd), the Finnish Aeronautical Association is anxious to receive details of the dates of arrival and expected departure of such visitors, together with particulars of any flying tour of Finland which may be contemplated. All necessary reception and documentation will be undertaken by the Association, but visitors must make their own arrangements for obtaining tickets for the games. Those interested are requested to write to the Suomen Ilmailuliitto R.y., Mannerheimintie 16 A, Helsinki, Finland, before April 15th.

THE British Gliding Association announces that only two entries were submitted for the Kemsley Winter Cross-Country Competition which closed on February 29th. These flights have not yet been judged, as one of the three judges is overseas, but even if both are awarded a prize there will still be a prize-money balance of fifty guineas. It has, therefore, been decided to postpone the judging until after April 1st, when there will be a meeting of the judges; after awarding the prizes for flights up to March 1st they will, at their discretion, award the balance of the prize money for meritorious flights made during the month of March.

Conditions for the extended competition remain as before, except that flights on any date may be reported briefly to the secretary up to 5 p.m. on April 2nd and full documentation may be sent in up to 5 p.m. on April 8th. Individual prizes will not be limited to any particular sum, number of entries, or type of launch, but will be awarded entirely at the discretion of the judges on the merits of each entry.

Also from the B.G.A. comes news of two useful documents which will shortly be available for the gliding enthusiast. The first is a *Manual of Two-seater Training* which is being printed in the form of a pocket booklet, similar to the basic syllabus of glider instruction. This edition is printed as amended at the Instructors' Conference and includes an exercise on out-of-wind take-offs and landings. Orders received will be executed as soon as the booklet (which costs 5s) is available; this, the B.G.A. hopes will be before Easter. The second document, to be available in April, is the *Glider Logbook*, as amended by the Technical Committee. The price, to be announced later, may show some increase on the previous 5s.

AT the annual meeting of the British Gliding Association, held at Londonderry House on March 8th, Mr. Philip Wills was elected chairman for the fourth consecutive year. Lord Kemsley was re-elected president, and Prof. David Brunt vice-president.

In his report the chairman said that British gliding organizations had flown over 17,000 hours during the past year; of this total, 7,834 hours were contributed by gliding clubs in the United Kingdom, 5,500 hours by the Air Training Corps and 4,000 by R.A.F. gliding clubs in Germany. Appeals for Government aid had been made, so far without result, in respect of an extension to the gliding clubs of the A.T.C. flying scholarship scheme and a revival of the subsidy scheme which was in force before the war.

Two-thirds of the principal gliding clubs now do all their training with dual-control sailplanes; the A.T.C. also, it appears, have begun to make considerable use of dual-control machines and are gradually discarding the old method of solo training.

THE first post-war glider to be built by the Focke-Wulf aircraft factory in Bremen has been given its test flight in the hands of Hanna Reitsch, the famous German woman pilot. This was the first glider flight that she had made since the war.

A DOCUMENT recently published by I.C.A.O., entitled *I.C.A.O. Doc* 6100 *COM*/504/1—*Communication Codes and Abbreviations*, contains the "Q" code, NOTAM code, procedure signals and miscellaneous abbreviations. On sale at Her Majesty's Stationery Office, this document is priced at 6s. 10d., or by post 7s. 1d. The new "Q" code differs from the present code in there being 30 new groups and 15 deletions. Various changes in signification have also been made and the complementary groups for use with the "Q" code in Section 2 of the current "Q" code, *Doc* 6100 *COM*/504, are included in the miscellaneous abbreviations in Chapter 5 of *Doc* 6100 *COM*/504/1. There are a number of additions to and changes in these abbreviations, e.g., the new abbreviation for Aerodrome Control is TWR. Many additional significations are given in the revised NOTAM code.

SERVICE AVIATION

Royal Air Force and Naval Aviation News

IN THE PUBLIC EYE: Primarily a tribute to the camera-art of Mr. Charles Brown, an exhibition of whose work is now to be seen in London (see page 329), this study of the first Vickers Valiant bomber is also a timely reminder that the second machine is due to fly at any moment; indeed, it may already have flown by the time these words appear.

Chief of Air Staff's Conference

FIVE days, March 24th to 28th, will be devoted to the conference "Unicorn" to be held by the Chief of the Air Staff, Marshal of the Royal Air Force Sir John Slessor. The venue is Old Sarum in Wiltshire.

"Unicorn" will be attended by senior officers of S.H.A.P.E., Allied Air Forces Central Europe, Commonwealth Air Force, United States Air Force, the Royal Navy, the Army and the Royal Air Force. Members of the Air Council, officers and officials of the Air Ministry and Ministries of Defence and Supply will also attend.

Among those invited are the Secretary of State for Air, Lord De L'Isle and Dudley; Lord Cherwell, the Paymaster-General; Air Chief Marshal Sir Hugh Saunders, Deputy (Air) Commander; Admiral A. G. Lemonnier, Deputy (Navy) Commander (S.H.A.P.E.); and Lt.-Gen. Lauris Norstad, Commander-in-Chief, Allied Air Forces, Central Europe.

In his opening address Sir John Slessor will set out the aims of the conference, which will principally concern the present and future operational aspects of sea/air warfare, land/air warfare, bomber offensive, and air defence and studies of the associated administrative and logistic problems. Papers will be read by Commanders-in-Chief, followed by discussions. Major-General Glenn O. Barcus, U.S.A.F., will speak on the lessons of the Korean campaign.

Air Chief Marshal Breadner

LAST week the Royal Canadian Air Force suffered a second loss. Following the announcement of the death of Air Marshal Edwards comes news of the death of Air Chief Marshal Lloyd S. Breadner in hospital at Boston.

Air Chief Marshal Breadner was a fighter pilot in the 1914-18 war and commanded the R.C.A.F. in Canada from 1940 to 1943. He was largely responsible for building up the Commonwealth air training scheme and for the final two years of the war directed the R.C.A.F. overseas.

Jungle Survival

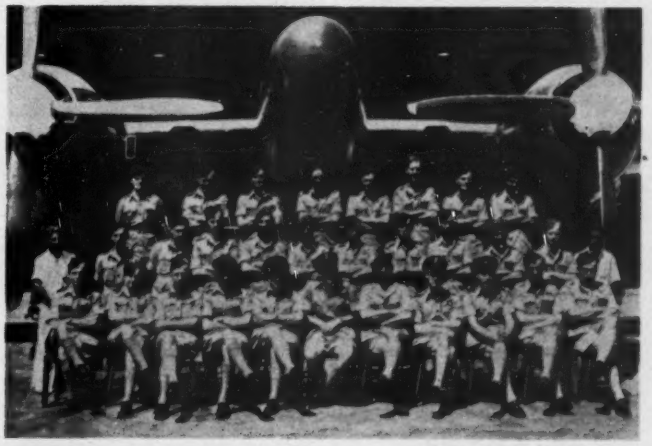
A SEVERE test started last Monday in which seven members of the R.A.F. began a week's trek through some of Borneo's worst forest and swamp areas, living entirely by the aid of a new type of jungle survival pack.

The airmen taking part in the trial are walking from Padang Spaoh, near Kuching in Sarawak, to a remote mission station at Banting. The total distance in a straight line is only 30 miles, but the going is extremely difficult.

The new pack takes the form of a cushion stuffed with concentrated food, first-aid kit, fishing tackle and other equipment. A ration for the entire journey can easily be held in one hand and includes oatmeal blocks, soups, meat extracts, eating and drinking chocolate and barley sugar. Each man's pack differs slightly in its make-up, and the exchange or sharing of food is forbidden.

River launches and native coracles took the airmen to the start, and on leaving the boats they were virtually in the same state as if they had baled out from an aircraft. Parachutes give cloth and shelter, the survival packs provide food and first aid, and pistols and fishing gear produce extra food.

The test has been organized by S/L. T. Brennan, a medical officer at F.E.A.F. headquarters, who is a member of the team. The other members are F/L.s P. Biegel, E. Iles and L. Thorogood, F/O. J. Williamson and Sgts. T. Saunders and A. Chater.



WEATHER OR NO: The air and ground crews of No. 1301 Meteorological Flight, which has operated from Ceylon for the past three years. The commanding officer, F/L. D. G. Walker, A.F.C., is in the front row, sixth from the left. An account of the flight's work appears on pages 312 and 313.

R.A.F. Appointments

THE Air Ministry has announced that A.V-M. L. F. Pendred, C.B., M.B.E., D.F.C., is leaving his appointment as Commandant of the School of Land/Air Warfare to become Assistant Chief of Air Staff (Operations). This follows last week's announcement that A. V-M. Sir Harry Broadhurst was to become the School's commanding officer.

A. V-M. Pendred is one of the very few officers to have won a D.F.C. in 1919. He was originally commissioned in the R.N.A.S., transferring to the R.A.F. on its formation in 1918. This new appointment will be his second tour of duty as an A.C.A.S.; from 1947 to 1950 he was A.C.A.S. (Intelligence).

A second appointment, announced at the same time, is that of A. V-M. A. Hesketh, C.B., C.B.E., D.F.C., to be A.O.A. Flying Training Command. Since last September A. V-M. Hesketh has been A.O.C. No. 23 Group, Flying Training Command. He also won his D.F.C. shortly after the end of the 1914-18 war—receiving it for service in South Russia.

Two Bravery Awards

FOR their share in rescue work after an accident to a Meteor 7 at Horsham St. Faith, L.A/C. J. W. Dorey has been awarded the British Empire Medal (Mili-

SERVICE AVIATION . . .

tary) and F/O. G. A. Faux, M.R.C.S., L.R.C.P., the Queen's Commendation for Brave Conduct. The citations, in part, read: "L. A/C. Dorey, a member of the fire crew, who had already worked valiantly in the task of controlling the fire and rescuing the pilot, climbed on to the fuselage and, despite the obvious danger of imminent explosion and the extreme discomfort from the flames and smoke, held the navigator as far away from the flames as he could. This he did to the limit of his physical strength, thus enabling the medical officer (F/O. Faux) more easily to administer to the injured man and finally effect his removal from the wreckage. L. A/C. Dorey thereupon collapsed from the effects of the smoke and his almost superhuman exertion and fell into the wreckage, from which he had to be dragged by his comrades. His magnificent conduct was largely responsible for the navigator being rescued alive; unfortunately he [the navigator] died subsequently in hospital."

Post Exchange

IN May next, two air commodores will exchange posts. A. Cdre. F. W. Fe'gate, C.B.E., who has been A.O.C. No. 206 Group, M.E.A.F., since last June, will take over A. Cdre. M. S. Shapcott's appointment as Director of Movements at the Air Ministry, and A. Cdre. Shapcott will assume command of No. 206 Group

R.Aux.A.F. Appointments

UNTIL recently commanding No. 2609 (West Riding) L.A.A. Squadron, R.Aux.A.F., S/L. R. Collier is now to take over No. 2608 (North Riding) L.A.A. Squadron.

The Air Ministry has also announced that W/C. W. Towson is the new commanding officer of No. 3613 (City of Manchester) Fighter Control Unit, R.Aux.A.F.

R.A.F.V.R. Overseas Flights

MORE than 200 flights to 2nd T.A.F. are being planned for navigators and signallers of the R.A.F.V.R. They will fly in Avro Ansons from their Schools and may visit Buckeburg, Wahn or Sylt. All journeys will be routed through Hendon.

Staff instructors will accompany each flight and opportunities will be given to pupils to familiarize themselves with European flying aids and procedures. The first aircraft left Panshanger on March 12th.

R.N.Z.A.F. Task Force H.Q.

THE Minister of Defence, the Hon. T. L. Macdonald, has announced the establishment at Auckland of a Task Force Administrative Headquarters within the Royal New Zealand Air Force. It will control the formation and training of new units which will come into being as a result of the compulsory military training scheme. The new headquarters will be commanded by A. Cdre. Wallingford, who will also act as Senior Air Force Officer, Auckland area. He will be succeeded on the Air Board by G/C. M. F. Calder, who will have the rank of Air Commodore.

The Minister also announced a revised system of training and trade-grouping for ground staff under the compulsory training scheme. The new system will make the men familiar with a trade after their initial three months training, and increase the range of trades open to them. It will also widen the scheme to include more 18-year-olds from outside the areas covered by the four territorial squadrons. The trainees will serve for three years in the Territorial Air Force—that is, for two years less than before. Ground staff trainees may volunteer for six months' extended service with the Regular air force after the initial three months' training.

PRINCE IN AUSTRALIA: The first of three standard 8 10-passenger Percival Princes ordered for the Long Range Weapons Establishment arrived at Woomera on March 7th after a journey of some 10,550 miles. In the above group are Percival Aircraft representatives with the R.A.A.F. delivery crew. Left to right: Mr. Goodwin, S/L. C. R. Gallway, A.F.C. (Captain), Mr. J. Lavender, F/O. E. Lane, Mr. K. Miller, G/C. W. N. Gibson, D.F.C. (S.A.S.O., R.A.A.F. H.Q., London), Sgt. H. V. Carne and Mr. I. H. Brown.

Naval Air Stations "At Home"

THIS summer Royal Naval Air Stations in all parts of the British Isles will again be "At Home" to the public. Additional attractions are planned, particularly in the demonstrations of service equipment.

Apart from giving the general public an opportunity of visiting Naval Aviation, the total income from these displays is devoted to naval charities. The various dates on which the "At Homes" will be held are :—

Eglinton, Co. Londonderry	...	June 26th
Anthorn, Cumberland	...	July 5th
Lee-on-Solent, Hants	...	July 12th
Lossiemouth, Morayshire	...	July 12th
St. Merryn, Padstow, Cornwall	...	July 19th
Arbroath, Angus	...	July 19th
Culdrose, nr. Helston, Cornwall	...	July 25th
Machrihanish, Argyllshire	...	July 26th
Ford, nr. Arundel, Sussex	...	Sept. 6th

For Service Golfers

A 1952 fixture-card and membership-list from the R.A.F. Golfing Society shows a particularly full list of matches with other Service clubs and with civilian clubs (we shall include fixtures of outstanding importance, as they draw near, in our "Forthcoming Events" panel).

The Society includes a ladies' section, which was formerly the W.A.A.F. Golfing Society.

Current membership of the R.A.F.G.S. —the president of which is Marshal of the Royal Air Force Lord Portal—stands at about 600. The hon. secretary is W/C. H. D. Nicholson, and the hon. match secretary is W/C. R. D. I. Scott, R.A.F. Station Padgate, Lancs.

R.A.F. Benevolent Fund

IT is announced that the address of the Appeals Committee of the R.A.F. Benevolent Fund has been changed from 1 Sloane Street, London S.W.1, to the Fund's headquarters at 67 Portland Place, W.1 (Museum 2654).

Unit Ties

PARTICULARS have been received of three new ties. For No. 64 Squadron a design has been approved which incorporates nine silver scarabs on an Oxford blue background. This may be obtained direct from the C.O., S/L. P. D. Thompson, No. 64 Squadron, c/o Information Division, Air Ministry, Adastral House, Aldwych, London.

The County of Gloucester Squadron has also used silver motifs on a dark blue background, but in this case they repeat the boar's head which adorns the centre of the squadron's crest. Ex-members of No. 501 may obtain these ties from the Adjutant, No. 501 (County of Gloucester) Squadron, R.Aux.A.F., Filton, Bristol, at 15s. each.

For wear when in civilian clothes, a tie has been designed for R.A.F. boy entrants. It incorporates diagonal stripes of red and green checks on an emerald-green background.

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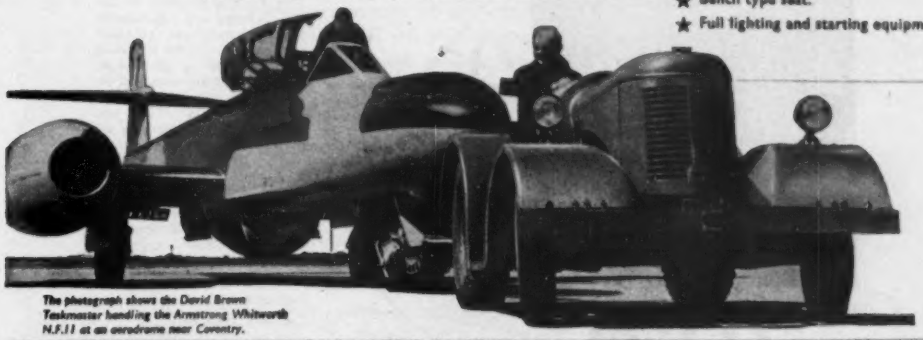

The photograph shows the David Brown Taskmaster handling the Armstrong Whitworth N.F.11 at an aerodrome near Coventry.

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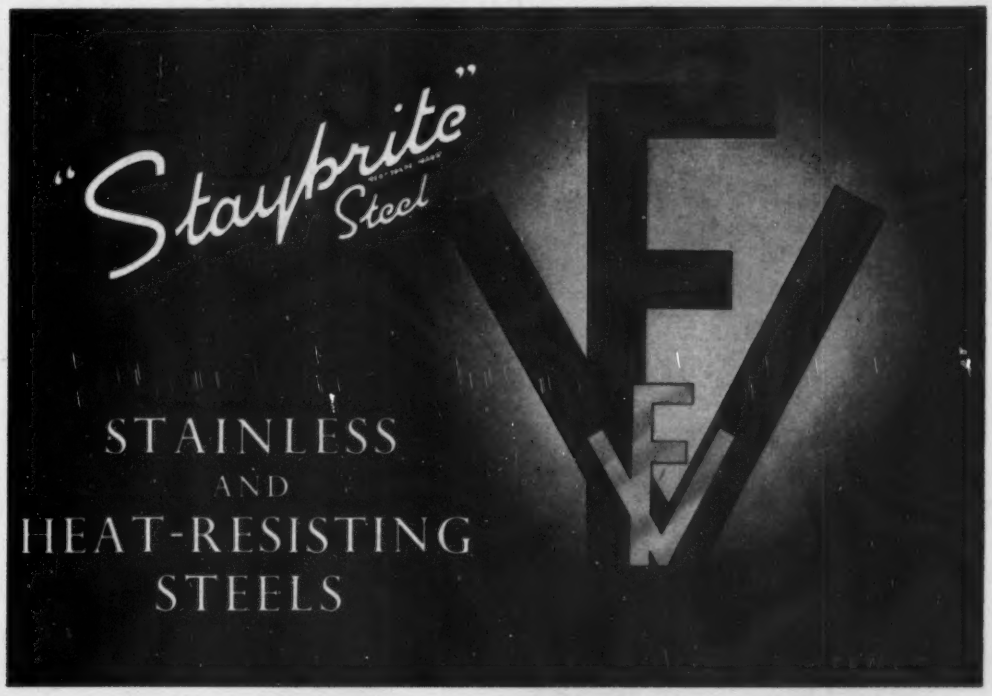

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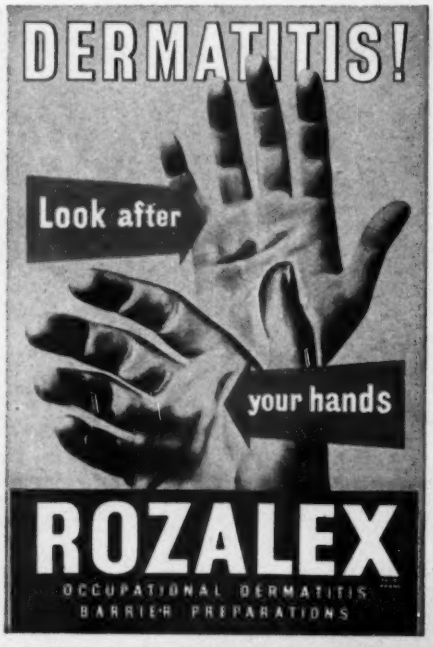

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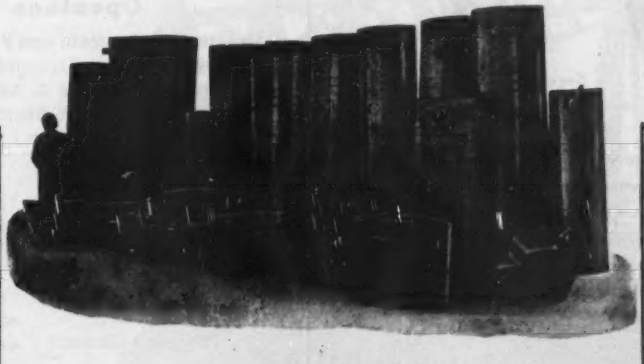

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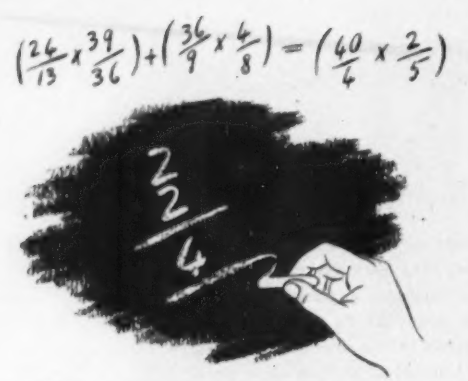

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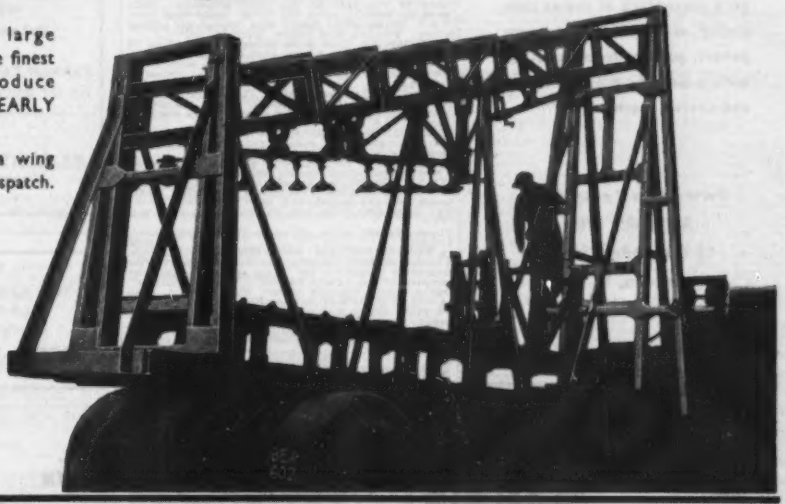

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AERO SALES, Inc., procurement specialists for all American aircraft, engines, accessories. Quotations furnished on all requests. Address: P.O. Box 97, Miami, International Airport Branch, Miami 48, Florida, U.S.A. London Agents: C. J. Fox and Sons, Ltd., 117, Victoria Street, London, S.W.1. Tel.: Victoria 0304/5. [0045

AIRCRAFT ACCESSORIES AND ENGINES WANTED

WANTED immediately, one complete Cirrus Minor II engine.—Box 7041. [7040

WANTED, all types of sparking plugs, engines and aircraft.—Vendair, Croydon Airport, Croydon 2777. [0009

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BROOKLANDS AVIATION, Ltd., Brooklands Aerodrome, Weybridge. C. of A. overhauls, modifications and conversions. Tel.: Byfleet 436. [0006

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YES, ex-editor caravan paper with U.K.'s largest selection and caravan business is Back Again in England (thank heaven) after his usual winter journey. Yes, back to take the "can" back for all caravan faults for a year, with a free-van-loaned-for-a-leaky-one and all repairs free—the only distributor to make this unconditional offer. Also, the only distributor with so many makes and vans for sale—almost every well-known make and all makes obtainable, and the Caravan Residents' Association to get and keep you a site. Good h.p. terms too (hurry here!). So why not write for 1 lb. of free advice articles and brochures to Taplow please. (See also our display and Caravan Residents' Association at Ideal Homes Exhibition), A. G. Jenkinson, Ltd. (our equal selection—London branch), 69 Oxford Street, London W.1 (corner Rathbone Place). Tel.: Langham 5606/7. Two minutes from Tottenham Court Road Tube Station. Open till 8 p.m. seven days a week. Also at Bath Road, Taplow, Bucks. Tel.: Maidenhead 7434/5/6. Always open. Easy to reach—right on Main A4. Outskirts Maidenhead. Taplow Station 4 miles. Now open: Portsmouth Branch, Corner of Sussex Place and Hammersmith Bridge Road, S.W.6. One minute Hammersmith Broadway. [0089

CARAVAN, "Pilot Panther," 4-berth, first-rate condition. £600.—Williams, Church Moor Hall, Church Stretton, Marshbrook 49. [7034

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R.A.F. and R.N. officers' uniforms purchased; large selection of R.A.F. officers' kit for sale, new and reconditioned.—Fisher's Service Outfitters, 62-68, Wellington St., Woolwich. Tel.: Woolwich 1056. [0027

CLUBS

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LEARN to fly at Redhill Aerodrome, Surrey. South London's nearest flying centre, 25 miles from Hyde Park corner. £2/10/- per hour dual; from £1/10/- solo; instrument flying, instructors' and advanced courses. Attractive clubhouse with full catering facilities.—Tel.: Nutfield Ridge 3345. [0047

LICENSED flying instructor offered flying time in exchange for his services at Croydon Airport.—Box 7084. [0005

CROYDON Airport. Flying instruction on Tiger Moth and Proctor. From £3/10/- per hour. Phone: Vendair, Croydon Airport, Croydon 2744. [0009

HERTS and ESSEX AERO CLUB, Broxbourne Aerodrome, Nazeing, Essex. M.C.A. approved 35-hour course; solo flying from 30s. per hour; residential; trial lessons 25/-; train from Liverpool Street, or Green Line Coach 715.—Tel.: Hoddesdon 2345, 2641, 3705. [0088

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WING COMMANDER R. H. STOCKEN, F.R.Ae.S., Eagle House, 109, Jermyn St., London, S.W.1. Tel.: Whitehall 9035. [0419

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Complete set of harness constructed to suit requirements.

Crystals to provide the necessary operating frequencies can also be readily supplied from stock, once again, to suit requirements; the same also applies to headsets.

The following facts and figures relate to these two forms of equipment:

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Weights:
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In the case of the TR.1143—100-125 Mc/s.
In the case of the SCR/522—110-156 Mc/s.

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Delivery:
Nil.

Further details of both equipments and any other form of aircraft radio equipment can be obtained by contacting us or by applying for a copy of our latest radio catalogue, "The Aero-Radiologue." This profusely illustrated handbook is free, and is typical of the inspired service normally associated with our Company.

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AIRCRAFT hangar for sale. 80ft clear span by 144ft. long by 30ft clear height. Doors one end. All steel. Covering steel or asbestos sheets.—Sellman Hangars, Ltd., Terminal House, London, S.W.1. (No agents, please.) [7784

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A HOTEL "permeated with the atmosphere of hazel-nuts, courtesy and willing service." Adjoining sandy beach. Children's nursery. Cocktail bar. Dancing. Five to 11 gns. inclusive. Brochure with pleasure.—Golden Hotel and Country Club, Winterton-on-Sea, Norfolk. [7812

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MISCELLANEOUS

CRANES for sale.

RANSOME RAPIER 6-ton super mobile, new 1948. Morris 5-ton petrol-electric, new 1945. Taylor 2-ton hydraulic-operated mobile crane.

WILLIAM R. SELWOOD, Ltd., Chandler's Ford, Hants. Phone 2275. [7744

MONOCHLORONAPHTHALENE (refined grade) in 5-gall. galvanised drums. Immediate delivery of up to 48 tons much below market price.—Box 7307. [7777

COILED rolled mild steel strip, deep drawing quality, available from the Continent. Mills as per buyers' requirements.—Write Box 7404. [7814

COMPLETE heating installation, comprising vertical oil cross-tube boiler by Cradley, Maker's No. 22284, Year 1945. Size 15ft. by 5ft. Evap. 2,000 lb/hr. W.P. 60 lb. with chimney, inductor, Worthington horiz. Duplex feed pump and gauge fittings. Serving 4 "Calorier" unit heaters by Standard and Pochin—2 Type 412 and 2 Type 413; all with fans motorized 400/3/50. Whole installation which includes spare brand new unit heater and all piping, has had little use and recently left factory industrial establishment, large garage, etc. Excellent insurance report. Available immediate delivery.

GEORGE COHEN, SONS and Co., Ltd., Wood Lane, London, W.12. Tel.: Shepherds Bush 2070. [7827

PATENTS

PATENTS ACT, 1949

NOTICE is hereby given that Dowty Equipment, Ltd., seek leave to amend the Complete Specification of the Application for Letters Patent No. 648,870 for an invention entitled "Improvements in liquid-fuel burners."

Particulars of the proposed amendments were set forth in the Official Journal (Patents), No. 2260, dated March 14th, 1952.

Any person may give Notice of Opposition to the amendment by leaving Patents Form No. 21 at the Patent Office, 25, Southampton Buildings, London, W.C.2, on or before April 5th, 1952.

J. L. BLAKE,
Comptroller-General.
[7817

PACKING AND SHIPPING

R. AND J. PARKS, Ltd., 143-6, Fenchurch St., E.C. Tel.: Mansion House 3581. Official packers and shippers to the aircraft industry. [0013

PERSONAL

EX-EMPLOYEES B.E.A.C. Northolt Airport who lived in Hostel between 1946-1951 are invited to contact Aeronautical Engineers Association, 116 Church Street, Croydon. [7821

TENDERS

JOY-RIDING RIGHTS to let at West Hartlepool Airport, only a mile from seaside resort of Seaton Carew. Apply, Airport Manager, 325, Linthorpe Rd., Middlesbrough. [7835

TIME RECORDERS

STAFF item checking and job-costing time recorders (all makes) for quick cash sale; exceptional condition. —Box 7281. [0040

TUITION

THE COLLEGE OF AERONAUTICS

A COURSE of lectures on Stability and Control of Aircraft at Subsonic Speeds will be given at the college from Monday, April 28th to Friday, April 25th, 1952. This is a repetition of the course given in October, 1951. The course will deal with the practical and theoretical aspects of the stability and control characteristics of aircraft flying at subsonic speeds, emphasis being divided between the estimation and flight testing of stability and control characteristics. The subject will be treated from first principles and is intended primarily for those with limited experience of stability and control problems. Fees for the course are: Tuition fee, £10/10/-; residence charge (including full board), £5/15/-. Copies of the syllabus and forms of registration can be obtained from the Registrar, the College of Aeronautics, Cranfield, Bletchley, Bucks. [7794

LONDON SCHOOL OF AIR NAVIGATION (1949), Ltd.

PERSONAL coaching for Commercial Instrument Rating, Senior Commercial, A.L.T.F. (conversion thereto) and Flight Navigator licenses. This school provides the most rapid and economical method of qualifying. I.C.A.O. standards.

COMPLETE "Study-as-you-work" courses. Simulates classroom instruction; lesson, questions, model answers. Unique in application, ideal those employed or seeking career from Services.

LINK instruction and R/T for all instrument Rating procedures. Any form of flying training at best quotations.—Brochure with terms: 9-10 King Street, London, W.C. Tel.: Riv. 7609. [0077

A.T. offer a refresher course in preparation for Commercial Pilot's License and Instrument Theoretical examinations.

COMMENCEMENT date whole course, April 7; duration 6 weeks, fee £25.

COMMENCEMENT date half course (Instrument Rating), April 28th; duration 2 weeks, fee £10/10/-.

FOR full details, apply to the Commandant, Air Service Training, Ltd., Hamble, Hants. [7824

LEARN to fly for £24; instructors' licences and instrument flying for £3 an hour; night flying £3/10/- an hour, residence 4 gns. weekly. Approved M.C.A. private pilot's licence course.—Willaking School of Flying, Ltd., Thruxton Aerodrome, Andover, Hants. [7809

TUITION

A.F.R.Ae.S., A.R.B. Certs., A.M.I.Mech.E., etc., on "no pass, no fee" terms; over 95% successes. For details of exams and courses in all branches of aeronautical work, navigation, mechanical eng., etc., write for 144-page handbook free.—B.I.S.T. (Dept. 703), 17, Stratford Place, London, W.1. [7907]

FREE! Brochure giving details of courses in all branches of aero eng. covering A.F.R.Ae.S., M.C.A. exams, etc. We are the only postal training college operated by an industrial organisation.—Write to E.M.I. Institutes, Postal Division, Dept. F28, 43, Grove Park Road, London, W.4. Tel.: Chiswick 4417. (Associated with H.M.V.) [7908]

SOUTHEND-ON-SEA MUNICIPAL FLYING SCHOOL, Essex. Tel.: Rochford 54304. Comprehensive training for private, commercial licences and instructors' endorsements. M.C.A. approved for 30-hour course. Auster aircraft fitted with radio. Hourly rates: Solo, day £3, night £4; dual 5/- extra; contract rate £2 10/-; Link trainer 10/-. No fees or subscriptions. Please write for further details. [7932]

COLLEGE OF AERONAUTICAL AND AUTOMOBILE ENGINEERING, Chelsea and Redhill. Aerodrome. Diploma course in aeronautical engineering combine full day workshop and technical training with coaching for R.Ae.S. Associate Fellowship examination. Parts 1 and 2 aircraft engineers, licences, etc., in preparation for executive positions.—Syllabus from the College Secretary, Sydney St., Chelsea, S.W.3. Tel.: Flaxman 0021. [0019]

LEARN to glide this summer. Between June and September Bristol Gliding Club are repeating their highly successful holiday courses for beginners. Instruction for International "A" and "B" Certificates under ideal conditions. Temporary club membership, hotel accommodation, meals and flying costs included in the comprehensive charge of 12 gns.—Further details from Hon. Course Secretary, 6, Longmead Av., Bristol, 7. [7779]

THE COLLEGE OF AERONAUTICS. A course of lectures on Compressibility Effects in Aerodynamics will be given at the College from Monday, May 19th, to Friday, May 30th, 1952. The course will cover both subsonic and supersonic flow and is designed to meet the needs of members of the aircraft industry or research establishments who wish to acquire a grounding in the subject and a guide to recent developments. Particular attention will be paid to problems of flight at high speeds. Fees for the course are: Tuition fee, £21; residence charge (including full board), £11 10s. Copies of the syllabus and forms of registration can be obtained from the Registrar, The College of Aeronautics, Cranfield, Bletchley, Bucks. [7855]

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service etc. if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is accepted from the provisions of The Notification of Vacancies Order 1952.

ROYAL NAVY

SHORT SERVICE COMMISSIONS IN THE INSTRUCTOR BRANCH

1. APPLICATIONS are invited from university graduates and qualified teachers under 30 years of age for short service commissions of 3, 4 or 5 years in the Instructor Branch, Royal Navy. Requirements are mainly for officers with qualifications in mathematics, science (physics, chemistry, metallurgy) or engineering, but a few vacancies exist for officers with degrees in English, history or geography, with a sound mathematics or science background. Opportunities will be afforded for officers, after two years' service, to be selected for permanent commissions. A short service engagement in the Instructor Branch will discharge any candidate's obligation under the National Service Acts.

2. Entry will be in two grades. Selected candidates with a first or second-class honours degree receive approximately £410 in their first year's service, £429 in the second year, £548 in third and fourth years, £594 in fifth year. Other candidates receive £319 in first year, £362 in second and third years, £429 in fourth and fifth years. Previous officer service in the recent war will be recognized for adjustment of seniority and rate of pay on entry. Accommodation and rations are provided, or allowances in lieu. Married officers, if aged 25 or over, receive marriage allowance of £336 per annum if not accommodated in official married quarters, £288 per annum if they are so accommodated and £146 per annum in either case if under 25. An initial outfit allowance of £141 is paid, together with a free issue of certain articles of clothing. A reduced allowance is payable to candidates with previous Naval Service as officers. Tax-free gratuities of £300, £450 or £600 are payable at the end of 3, 4 or 5 years respectively.

3. Instructor officers serve both ashore and afloat and their duties include both technical instruction and general education. Officers with suitable qualifications may also be trained and appointed for full- or part-time meteorological and weather forecasting duties.

4. Service in the Instructor Branch will, if desired, be treated as contributory service under the Teachers' (Superannuation) Acts, superannuation contributions being deducted from the above gratuities.

5. Apply to Director (P), Naval Education Service, Admiralty, London, S.W.1, for fuller details and application forms. [7819]

THE DE HAVILLAND AIRCRAFT CO., LTD., HAVE VACANCIES FOR SENIOR DESIGN AND INTERMEDIATE DRAUGHTSMEN

PREFERABLY WITH AIRCRAFT EXPERIENCE IN THEIR HATFIELD AND LONDON (REGENT STREET) OFFICES.

Applications, stating age, experience and salary required, to CHIEF DRAUGHTSMAN, THE DE HAVILLAND AIRCRAFT CO., LTD., HATFIELD, HERTS [0031]

HANDLEY PAGE, Ltd., have vacancies for:—

(a) JUNIOR assistants, male or female, for work in their Test House at Cricklewood, on material and process control.

(b) JUNIOR and senior assistants of H.N.C. or degree standard for work in their Mechanical and Structural Test Dept. at Radlett.—Write, stating age and full particulars of qualifications and experience, to: Staff Officer, Handley Page, Ltd., Claremont Rd., London, N.W.2. [7758]

JET ENGINE POWER CONTROLS ENGINEERS

First-class sound practical engineers required. Some experience desirable of the development and testing of aircraft jet engine accessories, particularly flow, acceleration and speed governing controls, burners and pumps. Exceptional prospects of advancement, excellent environment and conditions of employment. Pension Scheme. Also required, two senior and several junior draughtsmen, preferably with experience on light hydraulic controls and fuel metering equipment. Hostel available.

WRITE PERSONNEL MANAGER
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ARLE COURT, CHELTENHAM,
preferably in tabulated form, giving details of training and experience and mentioning age and salary expected.

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SITUATIONS VACANT

NAVAL AVIATION

YOUNG men between 17 years and 26 years are required for short service commissions in the ROYAL NAVY for eight years' flying duty as pilots or observers. It is intended that up to 30 per cent. of those completing the engagement shall, if suitable, be given permanent commissions. The remainder will pass to the Reserve for seven years and be paid a tax-free gratuity of £1,500. Applicants must have School Certificate with a pass in mathematics or a General Certificate of Education with passes at ordinary level in English language, mathematics and one other subject, all taken at the one sitting, or equivalent educational qualifications, and be physically fit.

Write to Secretary of the Admiralty (C.W.520 F.), Queen Anne's Mansions, London, S.W.1. [7805]

VICKERS-ARMSTRONGS, Ltd. (Aircraft Section) have vacancies at Hurn Depot for the following staff:—
AIRCRAFT STRESSMEN
DESIGN DRAUGHTSMEN
(aircraft experience preferable but not essential).
JIG AND TOOL DRAUGHTSMEN
(aircraft experience preferable but not essential).
FLIGHT TEST OBSERVERS
(experienced—at least H.N.C. standard—must be physically fit and approximately 30 years of age or under).
APPLY in writing, to Employment Manager, Vickers-Armstrongs, Ltd. (Aircraft Section), Weybridge, Surrey. Applications are subject to the approval of the Ministry of Labour and National Service. [7809]

HANDLEY PAGE, Ltd., have vacancies for:—
AERODYNAMICISTS of degree standard or with H.N.C. in aero subjects. Previous experience preferred.
WIND tunnel technicians of degree standard or with H.N.C. in aero subjects. Previous experience preferred.
STRESSMEN of degree standard or with H.N.C. in aero subjects. Previous experience preferred.
WEIGHTS control engineers with minimum qualifications of O.N.C. Previous experience preferred.
SENIOR design and intermediate draughtsmen, preferably with aircraft experience, for Cricklewood and Radlett offices. Consideration will be given to applicants with experience in light structural or mechanical engineering. Possession of O.N.C. or H.N.C. (Mech. or Elect.) an advantage.
LOFTSMEN with previous experience of full-scale layout work or similar workshop practice.
TECHNICAL authors, preferably with experience in the preparation of maintenance manuals, pilots' notes, technical specifications, etc.
TECHNICAL illustrators with previous experience in aircraft work.—Write, stating age, qualifications and details of experience, to: Staff Officer, Handley Page, Ltd., Cricklewood, London, N.W.2. [7760]

WESTLAND AIRCRAFT, Ltd., Yeovil, Somerset, require:—
SENIOR and intermediate draughtsmen.
STRESSMEN.
EXPERIENCED spares compilers.
APPLY, Employment Exchange. [7789]

S. SMITH & SONS (England), Ltd., Bishops Cleeve, Nr. Cheltenham, require the following staff:—
SENIOR engineer to lead a section in the design and development of small servo systems, including the application of gyroscopic and magnetic amplifier techniques. This is a permanent post and carries superannuation benefits, and housing assistance will be given to successful applicant. Commencing salary £900 to £1,200, dependent on age, qualifications and experience. Ref. 4/ENG.
SENIOR mechanical engineer to control design and development of a wide range of aircraft instruments and aircraft equipment. Applicants should have a sound technical education with previous design experience in pressure-sensitive elements and intricate mechanisms. Salary £900 to £1,200, depending upon age and experience. Ref. 1/ENM.
DEVELOPMENT engineers for development of high grade test equipment in connection with manufacture of automatic pilots and aircraft instruments. Work involves application of electronic techniques over a frequency range from zero to approximately 100 k.c. c.p.s., together with light electrical and mechanical engineering. Preference will be given to applicants with experience of applied measurements in one or more of the above engineering fields, but the foremost qualification is a sound appreciation of fundamental engineering principles. Salary according to qualifications and experience. Ref. 1/EN.
DEVELOPMENT engineers. Senior and junior engineers experienced in the design of electronic test equipment, including valve voltmeters, C.R.O., oscillators, etc. Applicants will be responsible for the development of research models to the production stage and must have a good fundamental knowledge of electrical theory and practical experience of design. Salary dependent on qualifications and experience. Ref. 2/EN.
DEVELOPMENT engineers for work on auto control and servo systems. Applicants with experience in low frequency electronic techniques, including the use of magnetic amplifiers. Preference given to those with previous experience in designing equipment for aviation requirements. Salary according to qualifications and experience. Ref. 3/EN.
WRITE, quoting reference numbers, and giving qualifications and experience, to the Personnel Manager. [7886]

APPLICANTS are invited for the following positions in the London area:—
PLANNING engineers and tool designers; applicants must have experience on aero materials and modern machine shop practice.
ALSO senior methods engineers, electrical and/or mechanical, with experience on development work in production shops. The positions are superannuated and offer considerable scope to men with adequate experience. —Write, giving full details in strictest confidence, to the Employment Officer, Rotax, Ltd., Chandos Road, Willesden Junction, N.W.10. [7806]

SITUATIONS VACANT

APPLICATIONS are invited for the following position in the Aircraft Division of the English Electric Co., Ltd., at Warton, near Blackpool.

1. ENGINEER for the design and development of a new supersonic wind tunnel project. Applicants should have good experience of this type of work. Degree or equivalent preferred (Ref. 6328).

2. ENGINEERS for flight test liaison with the South of England. Applicants should have technical experience in the aircraft industry and an honours degree in engineering or its equivalent. (Ref. 6038.)

3. ENGINEERS for aero-elastic and allied investigations. Applicants should have aerodynamic or structural training and experience. (Ref. 6268.)

All these vacancies are for professional engineers. Applications, giving full details and quoting appropriate reference may be addressed to Central Personnel Services, English Electric Co., Ltd., 34-39, Gillingham Street, London, S.W.1. [7045

WANTED, flying instructor with Mosquito experience. —Apply C.F.L., Airwork, Ltd., R.N.A.S. 94, Davidstow, Penzance. [7084

SENIOR stressman required by South Coast firm for work of great interest. Excellent conditions.—Apply, Box 7495. [7098

THE DE HAVILLAND AIRCRAFT Co., Ltd., Airspeed Division, Christchurch, Hampshire, have the following vacancies:—

SENIOR design draughtsmen required for expanding programme of new project development work on civil and military aircraft. Saturday or Sunday interviews arranged.

SENIOR planning engineers, for machine shop, press and fitting shops.

APPLY to nearest Ministry of Labour for Submission A Card. [7085

PILOT instructor and ground engineer required for Auster and Messenger aircraft.—Apply, Shannon Aero Club, Limerick, Eire. [7062

GROUND engineer required with "A" and "C" Licences. —Apply: Midland Aero Club, Elmdon Airport, Birmingham 26. [7080

STRESSMEN required for aircraft structural work.—Tiltman Langley Laboratories, Ltd., Redhill Aerodrome, Surrey. [7090

AIRCRAFT or mechanical draughtsmen required, all grades, for appointment at Langley Offices.—Apply, in first instance, stating age, experience and salary required, to:—

THE Chief Draughtsman, Alan Muntz and Co., Ltd., (Aircraft Section), Heston Airport, Hounslow, Middlesex. [7090

DRAUGHTSMEN required for commercial and jig and tool drawing offices.—Write, giving full particulars, to Personnel Department, Vickers-Armstrongs, Ltd., South Marston, near Swindon, Wilts. [7040

ASSISTANT chief ratefixer required for aircraft company in the South of England.—Write, giving full particulars, to Box L8880, A. K. Advg., 32a, Shaftesbury Avenue, W.C.2. [7035

JAMES YOUNG, Ltd., Bromley, Kent, urgently require bench fitters for aircraft metal components.—Apply to your local Ministry of Labour and National Service. [7096

AIR SCHOOLS, Ltd., requires flying instructors at Derby, Elstree and Wolverhampton.—Apply, stating experience and qualifications, to 79 Buckingham Gate, London S.W.1. [7051

EAGLE AVIATION, Ltd., have vacancies for aircraft captains, also pilots with commercial licence and instrument rating.—Apply Chief Pilot, Luton Airport, Luton 9737. [7050

JIG and tool draughtsmen required by Percival Aircraft, Ltd., Luton Airport, Beds, fully experienced.—Applications, in writing, to Manager, Ministry of Labour and National Service, Luton, Beds. [7080

LICENSED radio engineer and radio mechanics at our base at Stansted Airport, Essex.—Apply by letter or telephone, to the Senior Radio Engineer, Aviation Traders, Ltd., Southend Airport, Essex. Tel.: Rochford 54321. [7056

REQUIRED immediately, Dakota captains. Salary in accordance with B.A.L.P.A. rates.—Apply, Chief Pilot, Air Transport (Charter) (C.I.), Ltd., Blackbushe Airport. [7081

H. M. HOBSON, Ltd., Fordhouses, Wolverhampton, require draughtsmen for design of test rigs and test equipment in connection with aircraft fuel systems and hydraulic accessories.—Apply through local Employment Exchange. [7089

LABORATORY assistant (male or female) required for interesting new development work in connection with plastic structures. Previous experience not essential but good science training an advantage.—F. G. Miles, Ltd., Redhill Aerodrome, Surrey. [7081

FLYING instructors, minimum "B" C.P.S. category. Staff pilot (Anson 21). Signals instructor (flying). Navigation instructor (ground lectures only), for basic flying school.—Applications with particulars to Chief Instructor, Reid and Sigrist, Ltd., Desford. [7052

SENIOR designer draughtsman required, S.E. London area, with experience of design and development of aircraft instrument mechanism.—Applicants should write, stating age and salary expected, with details of experience, to Box F.926, at 191, Gresham House, E.C.2. [7030

JUNIOR draughtsmen required, S.E. London area, with experience of design and development of aircraft instrument mechanism.—Applicants should write, stating age and salary expected, with details of experience, to Box F.927, at 191, Gresham House, E.C.2. [7094

LANCASHIRE AIRCRAFT CORPORATION, Ltd., require qualified pilots, navigators and radio officers for their York fleet.—Please forward full details to the Personnel Manager, Lancashire Aircraft Corporation, Ltd., Hoveringdon Airport, Hertfordshire. [7066

WEIGHT estimator required by Percival Aircraft, Ltd., Luton Airport, Beds, for work on fixed wing and helicopter aircraft.—Apply, giving details of age, qualifications, experience and salary required to: Manager, Ministry of Labour and National Service, Luton, Beds. [7092

GLOSTER AIRCRAFT Co., Ltd., have vacancies for fully experienced aircraft structural and electrical draughtsmen.—Applications, in writing, stating age, experience and salary required, must be made through an Employment Exchange or Scheduled Agency. [7010

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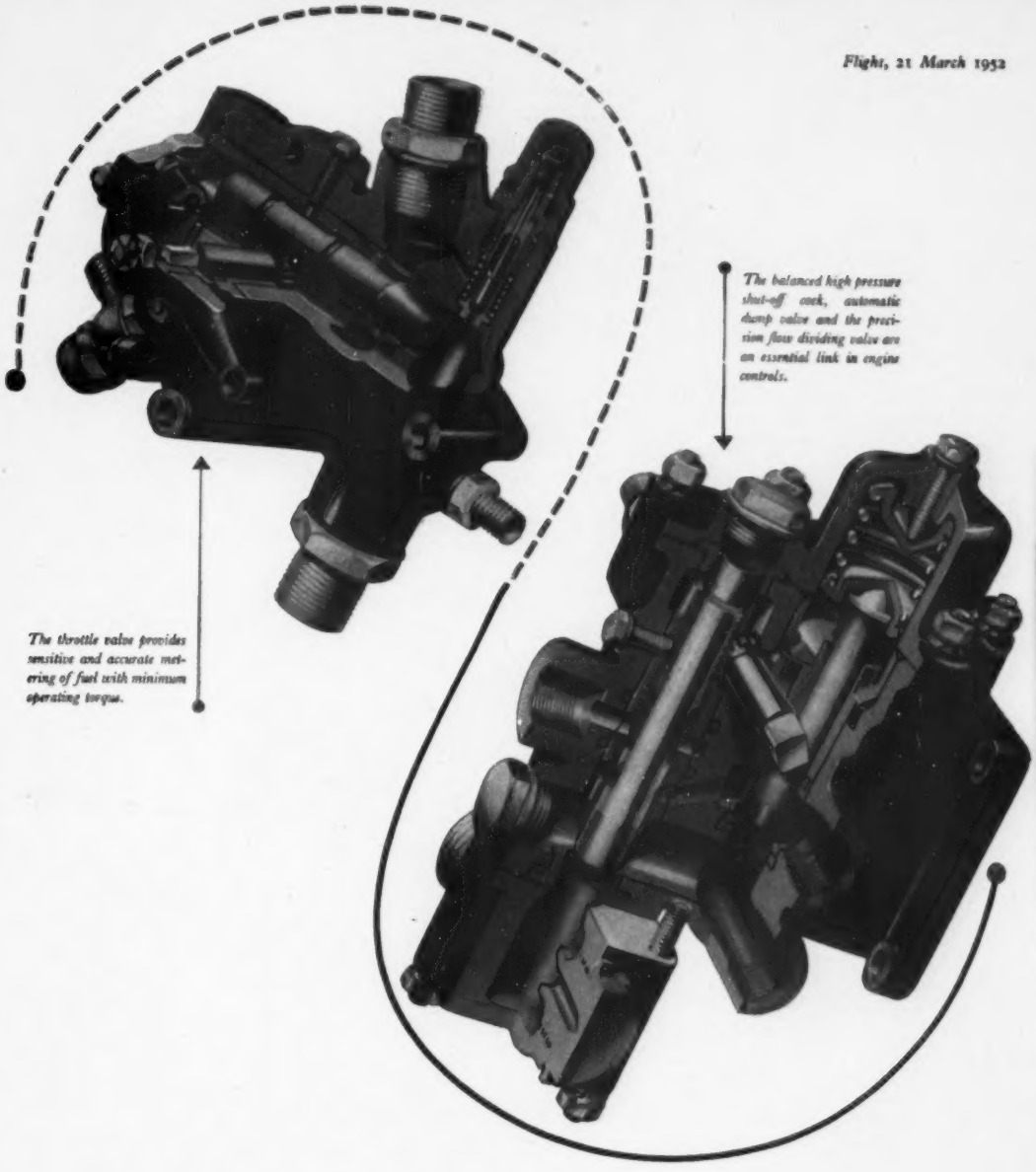

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